Heating Piping & Air Conditioning

APRIL 1957

Contents 5

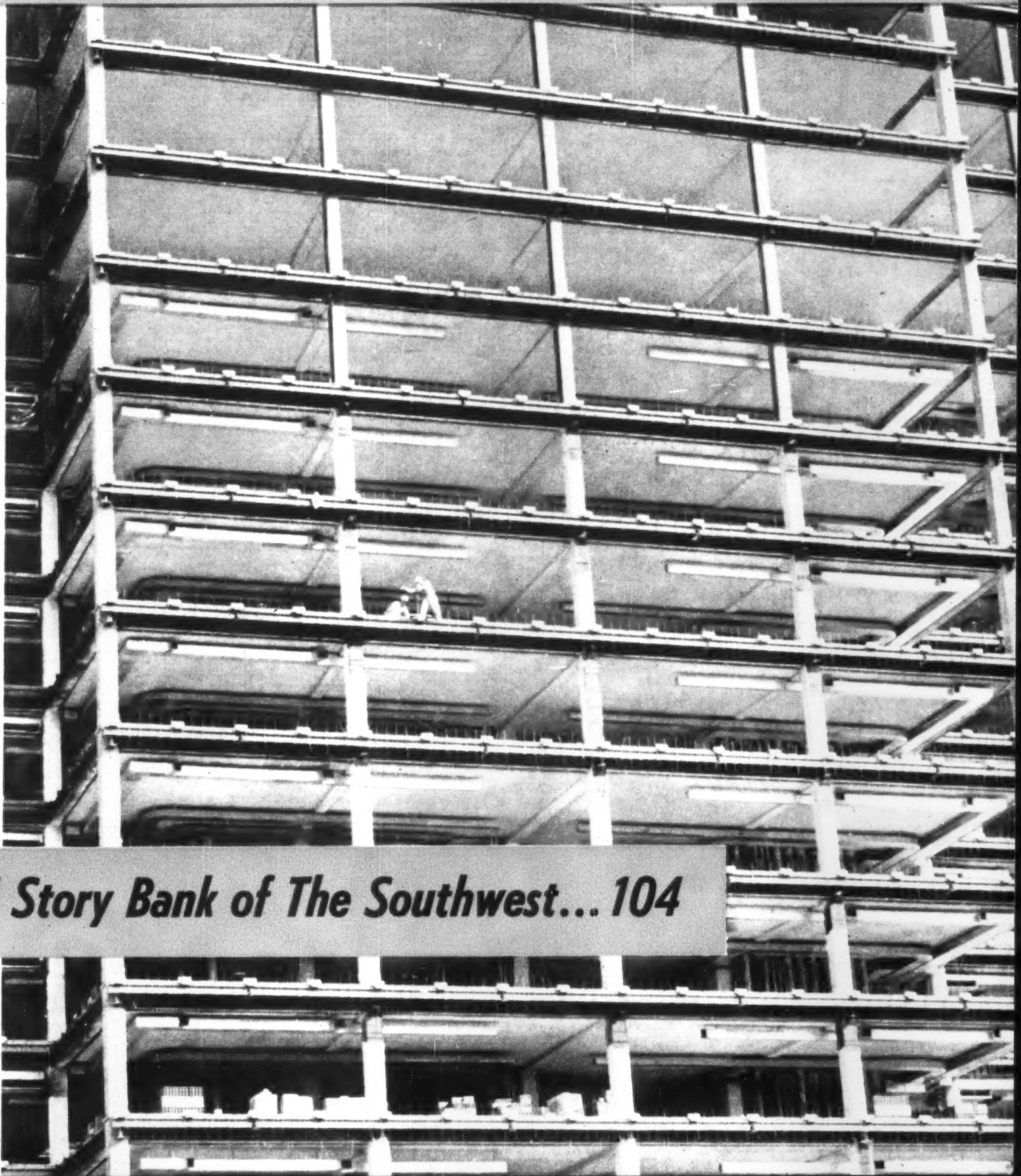
Data Sheet .. 135

INDUSTRIAL • COMMERCIAL • INSTITUTIONAL • PUBLIC BUILDINGS

Journal Section of the American Society of Heating and Air-Conditioning Engineers—137

HOW HTHW HEATS AIR BASE SEVEN WAYS 110

PLANT MAINTENANCE JOB IS CHANGING FAST 120



Air Condition 24 Story Bank of The Southwest... 104

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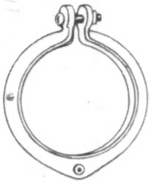
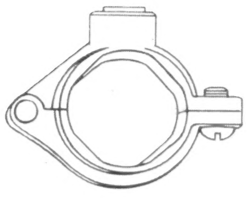
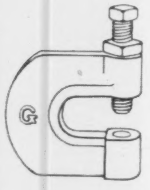
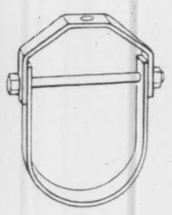




GRINNELL packaged PIPE HANGERS





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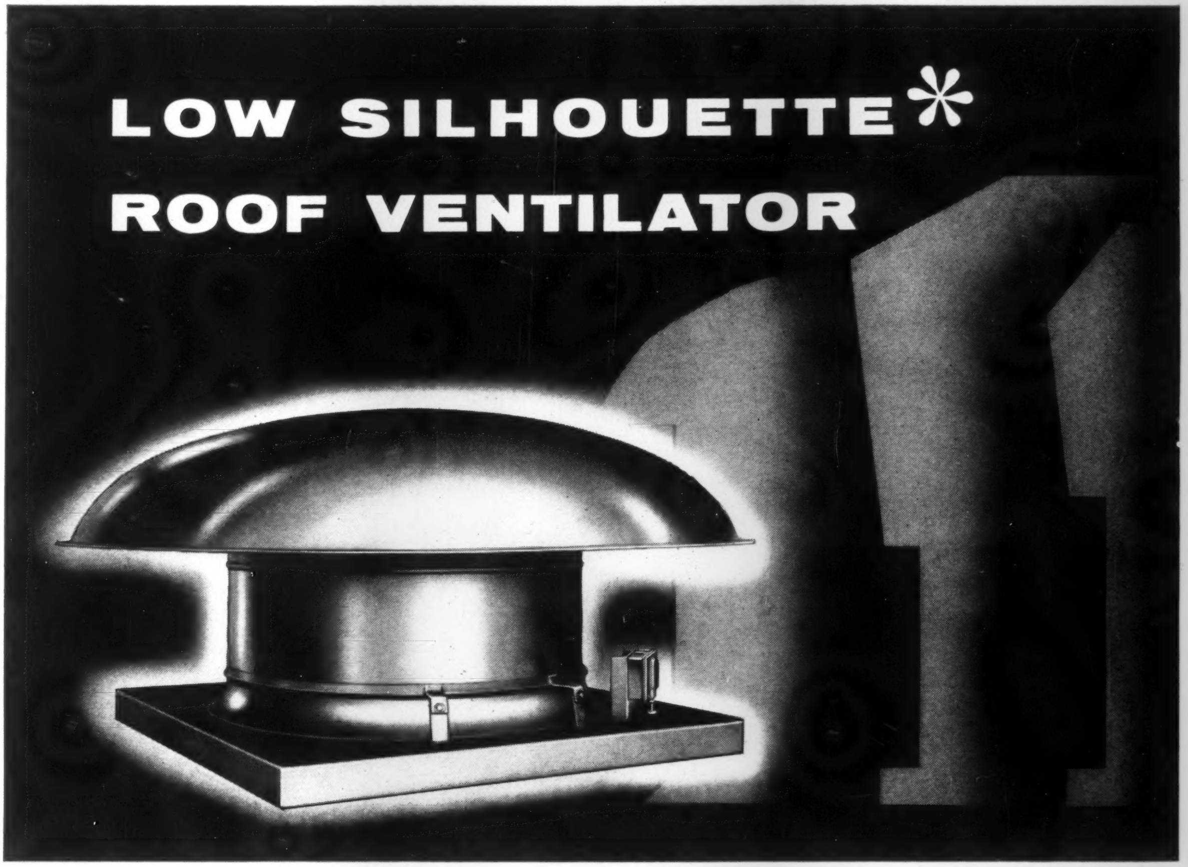

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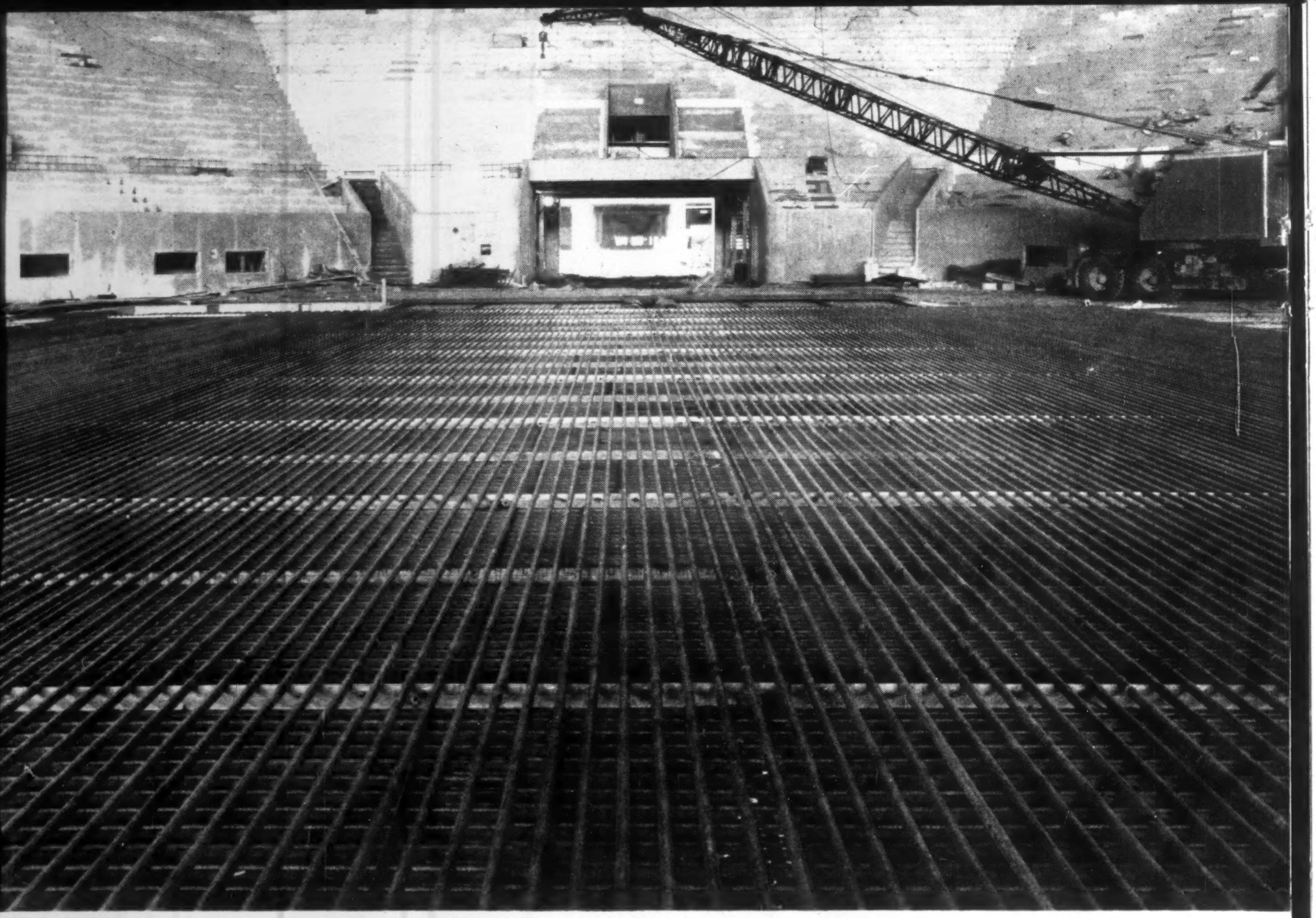

52,000 feet of wrought iron pipe provide built-in protection against corrosion for ice skating rink at new Kentucky Fair and Exposition Center, Louisville.

Ten miles of Wrought Iron Pipe checks corrosion at this ice skating rink

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Vol. 29 No. 4

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Features

1250 Ton System Conditions Cleveland's Auditorium 95
Vincent Eaton

How Natural Hot Springs Heat Iceland via District Heating 99
William J. Whatley

New Formula Gives Pipe Lap Thickness for Schedules 5S and 10S 102
A. R. C. Markl

How 3000 Ton System Conditions Bank of The Southwest 104
Guy Furgiuele

How 10 Cases of Wrong Design Were Corrected 107
C. T. Baker

How HTHW Heats Westover Field Air Base Seven Ways 110
J. F. Gschwind and J. A. Bement

Pipe Fitter Apprentice Training Pays Dividends at Standard Oil 114
Brace H. Lambert

Sam Lewis' Page 117
Preheat coils that freeze create problem in ill designed system

New TWA Maintenance Hangar Has Variety of Heating Units 118
Also has air conditioned small areas, snow melting

Plant Maintenance Job Is Changing Fast 120
Changing patterns surveyed by experts at recent conference

Teamwork Must Cure Atmospheric Ills Now 124
Raymond B. Allen, M.D.

Air Conditioning Installations Soaring 126
Consistent future growth predicted in recent survey

How to Increase Efficiency of Plant Piping Systems 128
Robert J. Pinske

The Law and Your Profits 131
Subcontractor didn't seem to know his own name

Four Systems Condition U. S. Rubber Co. Building 132
Lewis Smith

Data Sheet 135
How to apply semi-rigid insulation for heating and air conditioning

ASHAE Journal Section

Four Methods for Determining Sound-Power Output of a Fan 139
W. F. Kerka

Performance of Intermittently-Fired Oil Furnaces 147
W. G. Colborne

Symposium on Dehumidification 152

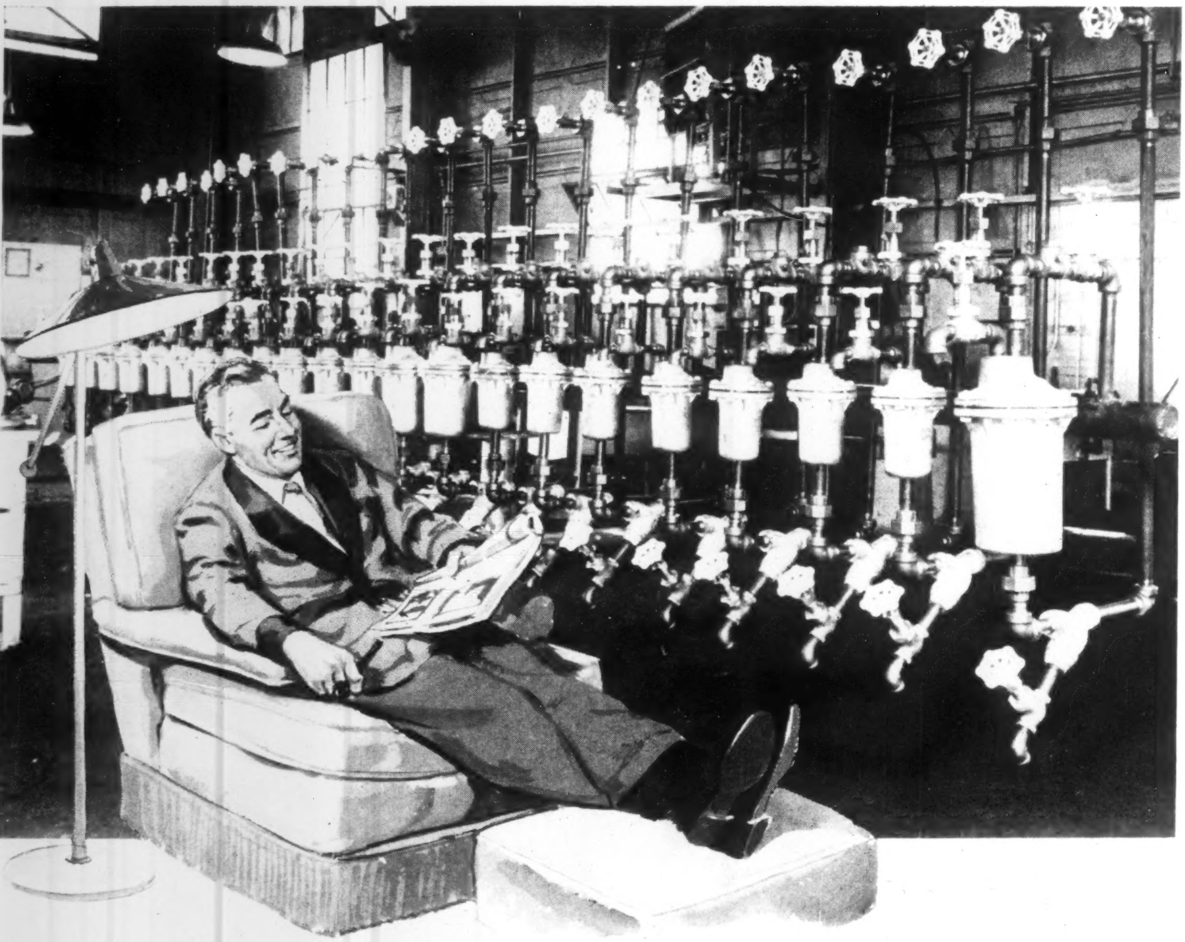
Cleaning of Industrial Effluents 166
J. M. Kane

For complete Journal Section table of contents see page 137

Departments

The Editors' Pages 83
"Open for Discussion" 87
Question of the Month 90
On the Job 134
Equipment Developments 213
Recent Trade Literature 264
Who's What 281
We Hear That 288
Meetings and Conventions 294
New Books and Reports 302

Index to Advertisers 304



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WHEN YOU specify steam traps, what could possibly be more important than *the cost of living with them*—production cost . . . steam cost . . . downtime cost . . . repair cost.

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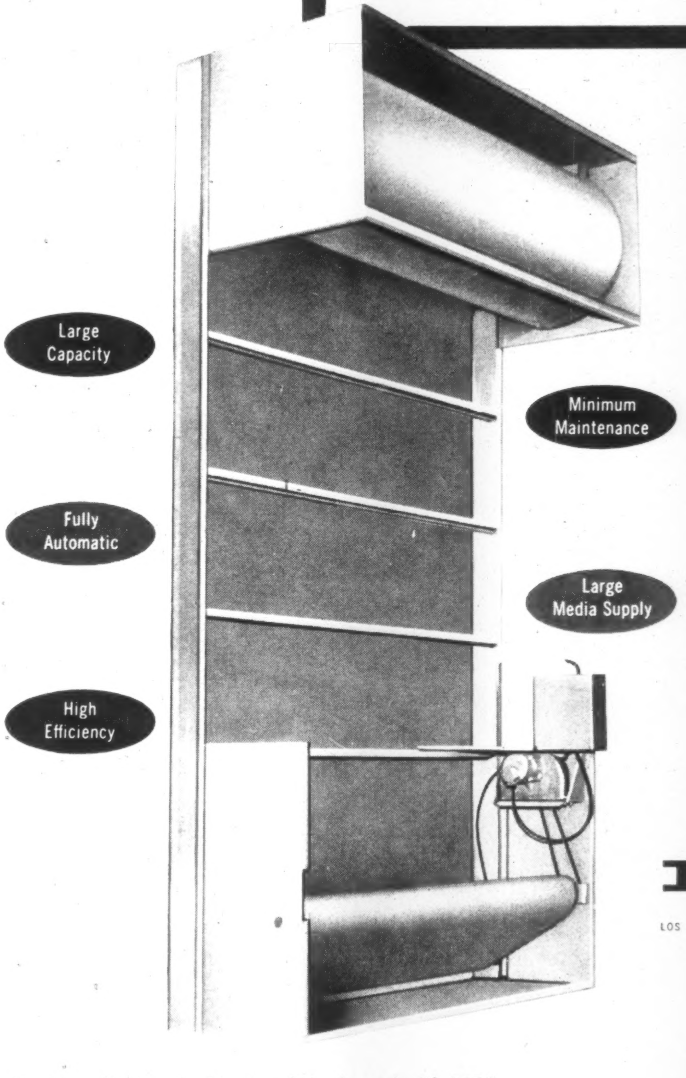

Here is a new, modern filter that combines fully automatic operation and high efficiency with large dirt holding capacity and minimum maintenance. Engineered for simplicity of operation, the Roll-Kleen offers dependable performance at low operating cost.

HOW IT WORKS

Glass fiber media with an open mesh cloth backing bonded to the downstream side, passes from the top supply roll, over the filtering area support grid, and onto the takeup roll. A preset rise in filter resistance, indicating dirty media, triggers the takeup roll drive to draw clean media completely over the support grid. This complete change-out assures maximum efficiency at all times.

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The Roll-Kleen is designed to operate at 350 to 520 fpm face velocity. Efficiency on Standardized Fine Air Cleaner Test Dust is 85% at 520 fpm and 80+% at 350 fpm.

MAINTENANCE

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Made of the finest quality components, the Roll-Kleen is available in standard widths of 3, 4 and 5 ft. and heights from 5 ft. to 15 ft. Units may be joined together to meet any CFM requirement.

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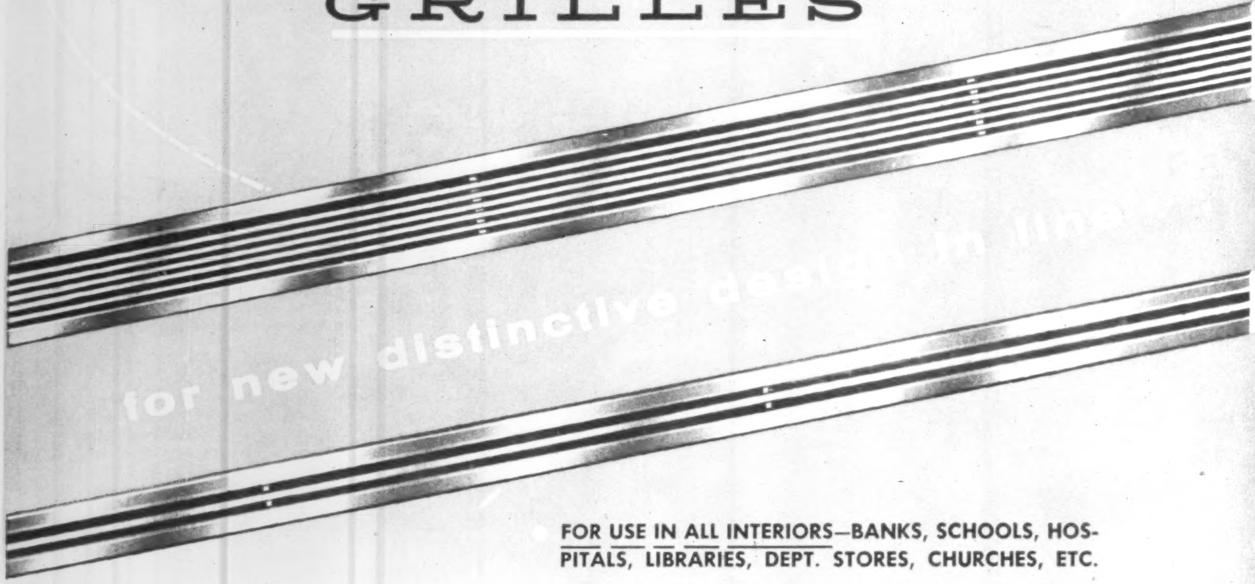

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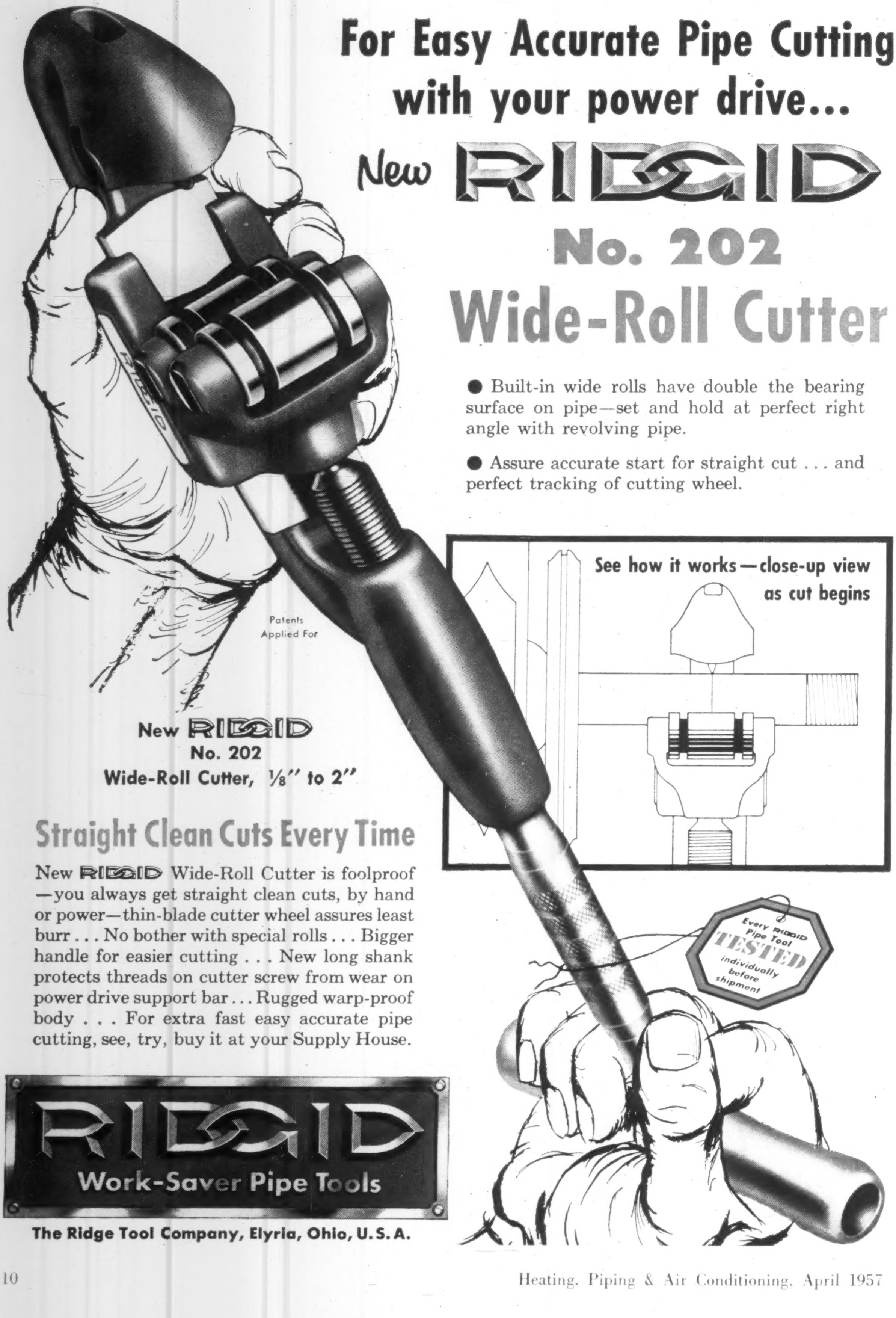
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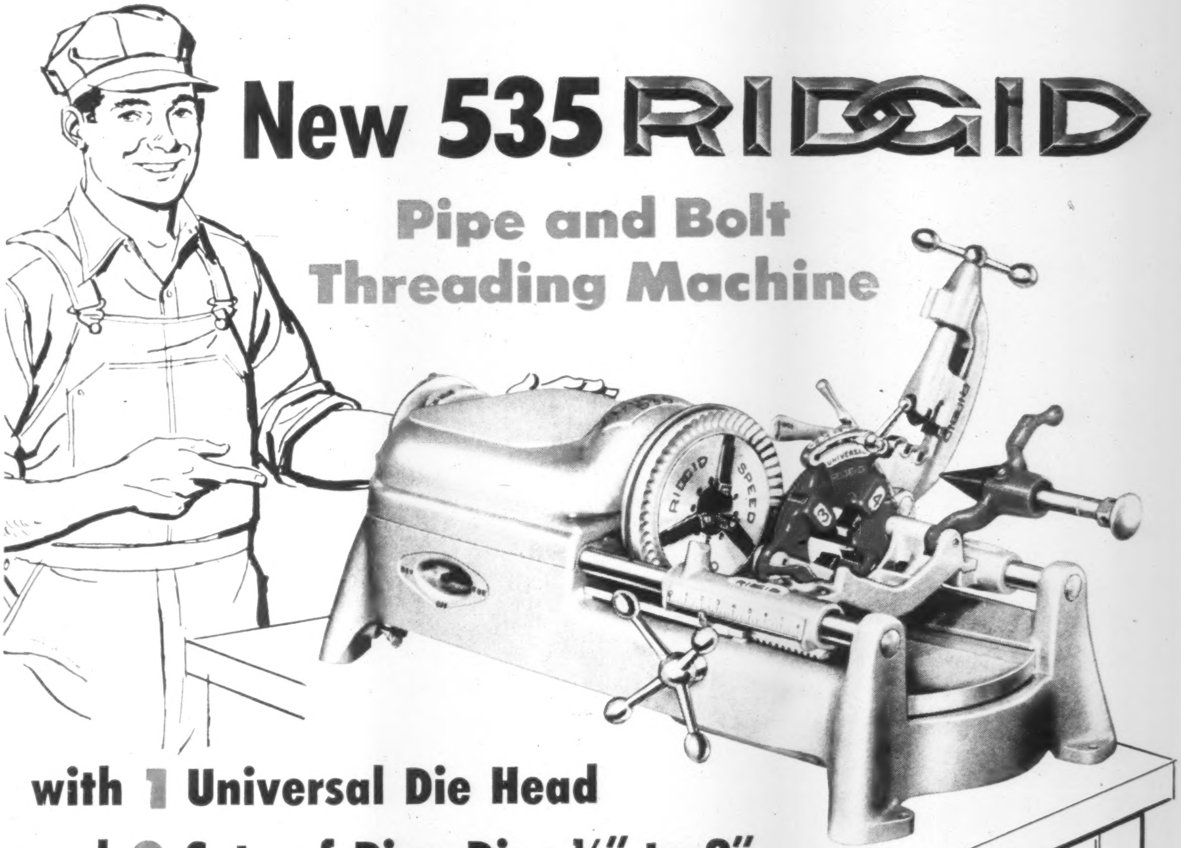

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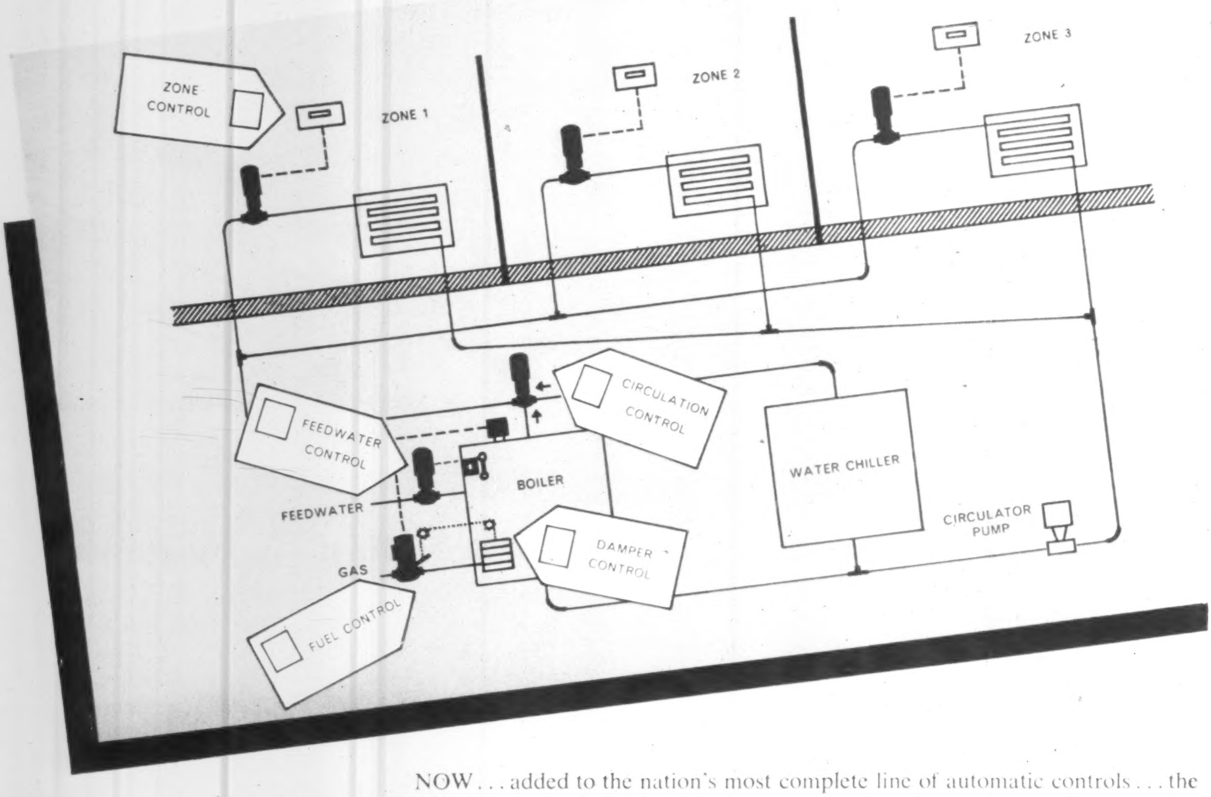
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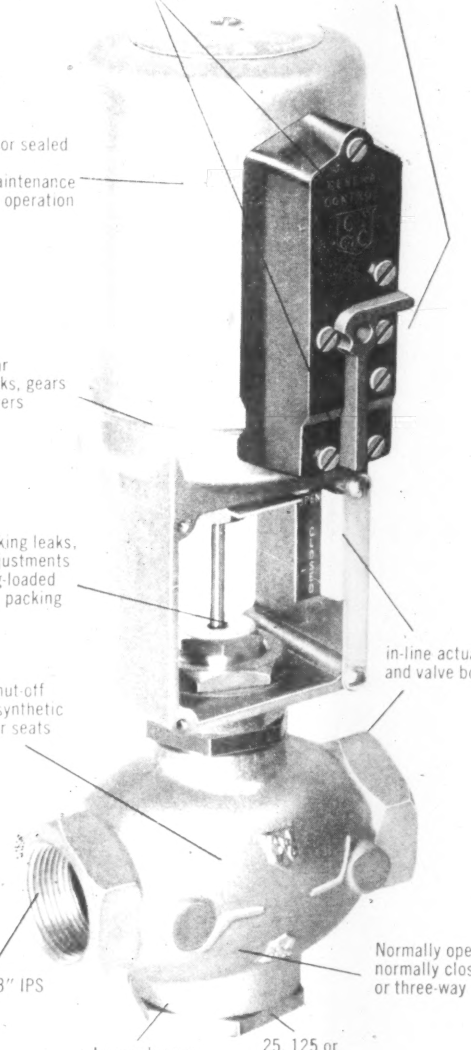
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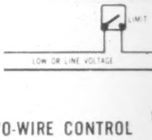
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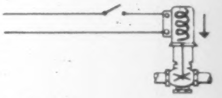

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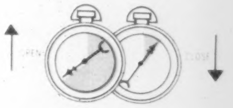

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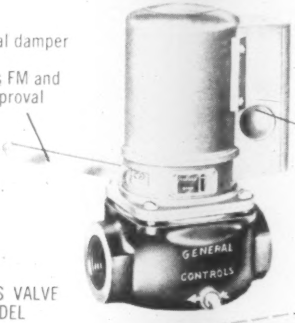
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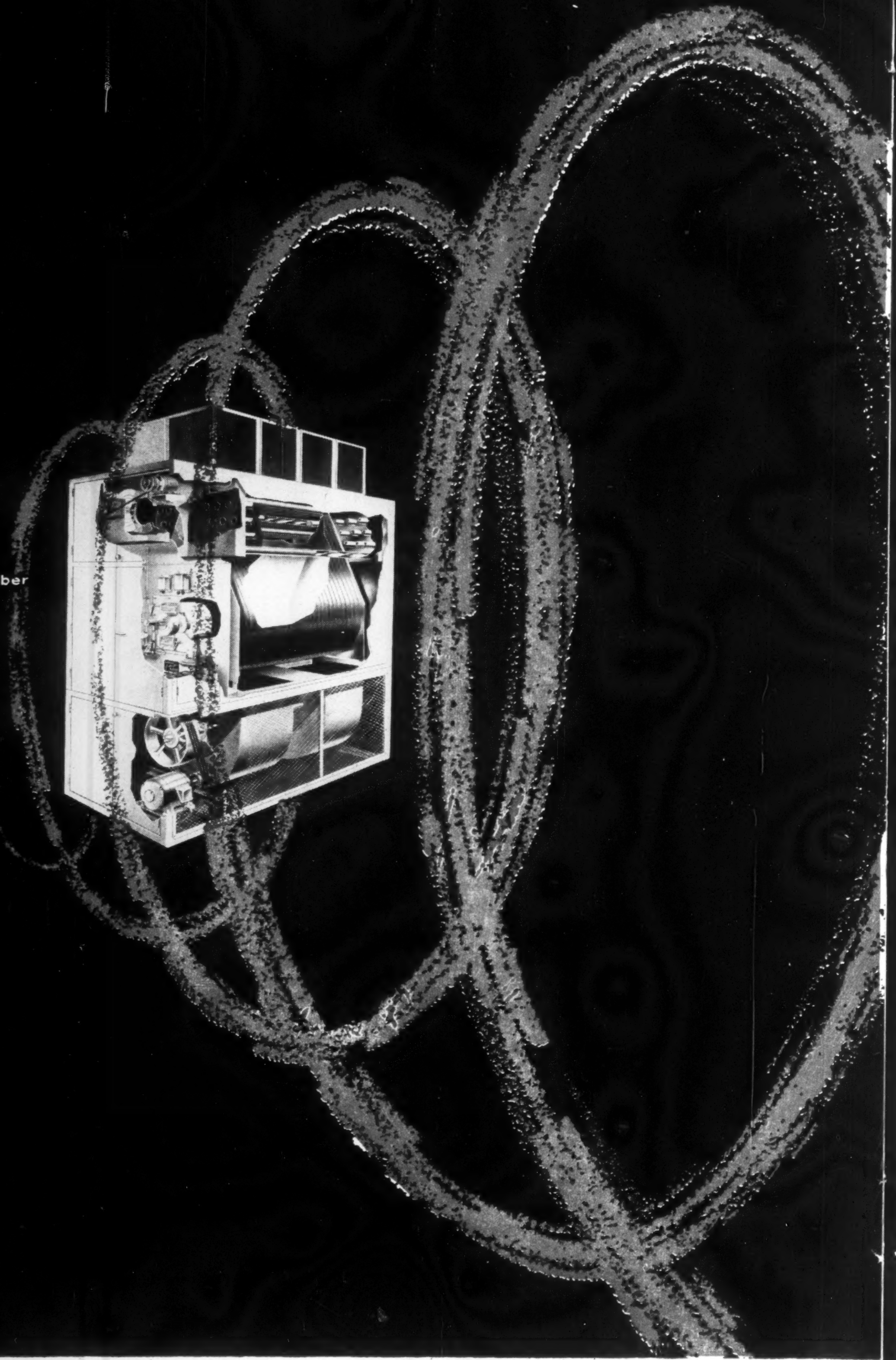

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- Control options: on-off, hi-low-off, or full range modulation

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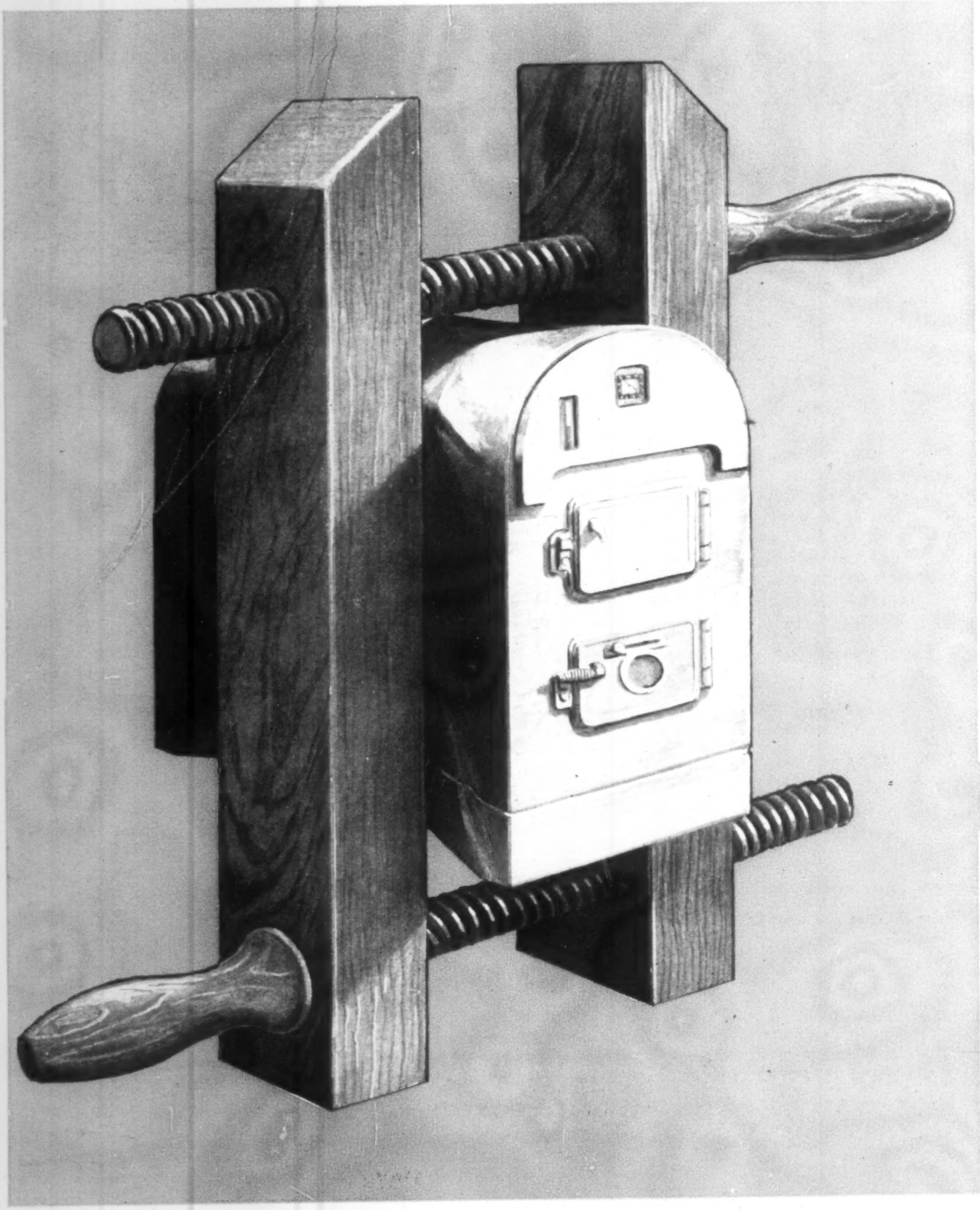
Blast furnace blowers • boiler and power plants • bridge sub-structures • cab conditioners • docks and unloaders • dredging • fabricated piping foundations • gantry and floating cranes • gas and oil pumping stations • locks and dams • ore and coal bridges • process equipment • pumphouses and intakes • river sand and gravel • sintering plants • slopes, shafts, tunnels • space heaters • steel grating • towboats, barges, river transportation

HERE'S THE WAY TO BEAT THE SQUEEZE ON BOILER SALES

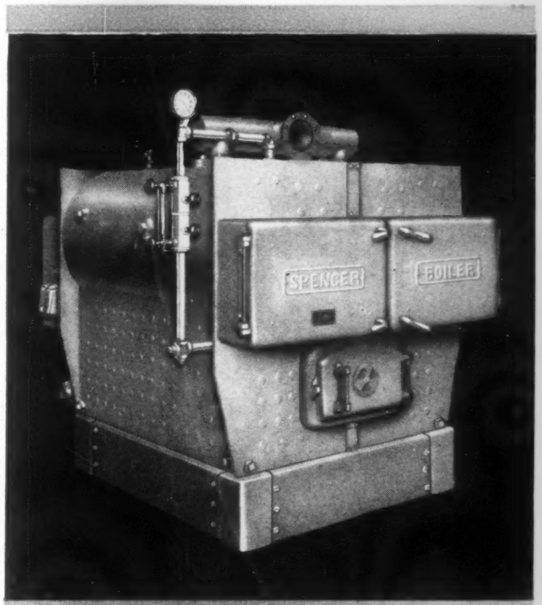


Here's the one boiler that enables you to land more installations in the booming commercial construction market.

install the unique

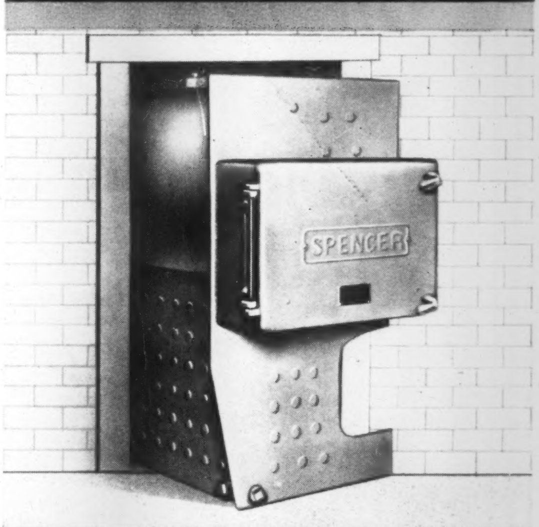
SPENCER "LW"

No other boiler offers these important product advantages to builders



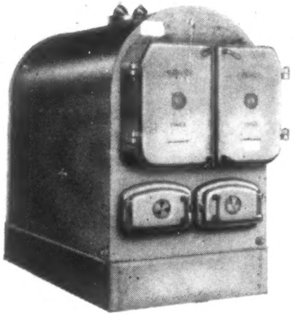
Lower waterline—over-all height of Spencer "LW" is approximately 25% less than conventional fire-box boilers . . . eliminates pit usually required in new buildings for these commercial boilers . . . saves the builder high costs of excavation . . . returns high profits.

Built in two sections—in existing buildings, divided design permits entry through narrow basement openings. In modernization, the builder is saved cost of tearing out walls. The two watertight sections are moved in separately with no welding needed.



The Spencer "LW" Divided, Low-Waterline Boiler has been proven in the field—acclaimed by contractors and builders as the ideal solution to problems of low headroom, excavation and limited entry space for both existing and new construction. The Spencer "LW" Boiler is available in a complete range of sizes from 2,200 to 42,500 sq. ft. steam SBI ratings.

THE SPENCER LINE CAN BUILD UP YOUR BOILER BUSINESS

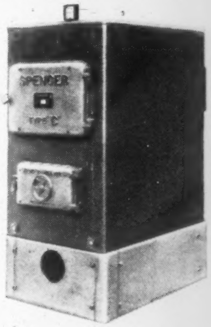


SPENCER "A." Complete range of sizes from 3,500 to 50,000 sq. ft. steam, SBI ratings. For every building . . . for every fuel.

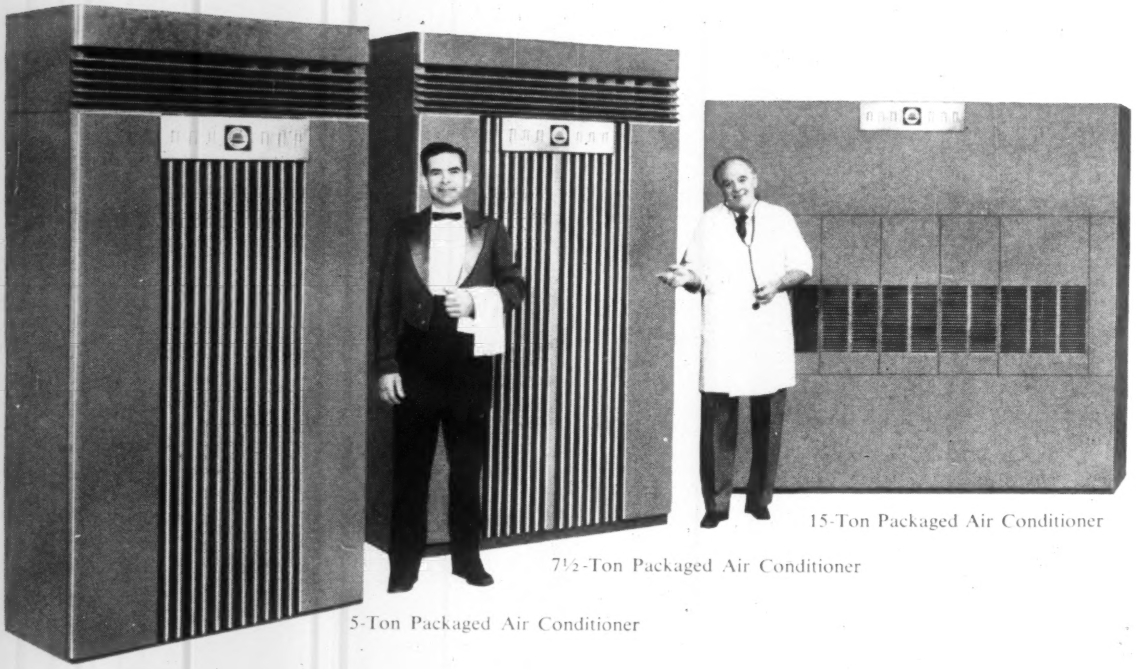
SPENCER
HEATER
LYCOMING DIVISION
WILLIAMSPORT AVCO MANUFACTURING CORPORATION PENNSYLVANIA

H SBI

For complete details on the boilers shown, or any of the residential or commercial boilers in Spencer's complete line, write to Spencer Sales, Avco Manufacturing Corporation, Williamsport, Pennsylvania.



NEW SPENCER "C" Heavy-duty commercial boiler performance at a residential boiler price! Can be fired with oil, gas or coal.



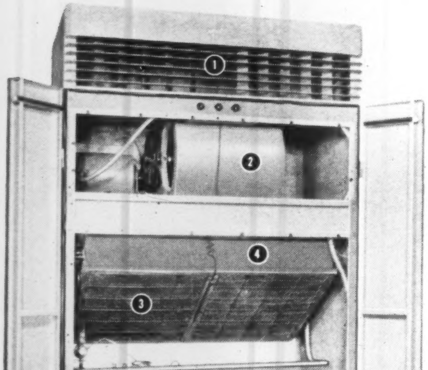
15-Ton Packaged Air Conditioner

7½-Ton Packaged Air Conditioner

5-Ton Packaged Air Conditioner

All-new American Blower Packaged

OUTSTANDING PERFORMANCE! QUIET OPERATION! LOW OPERATING COST!



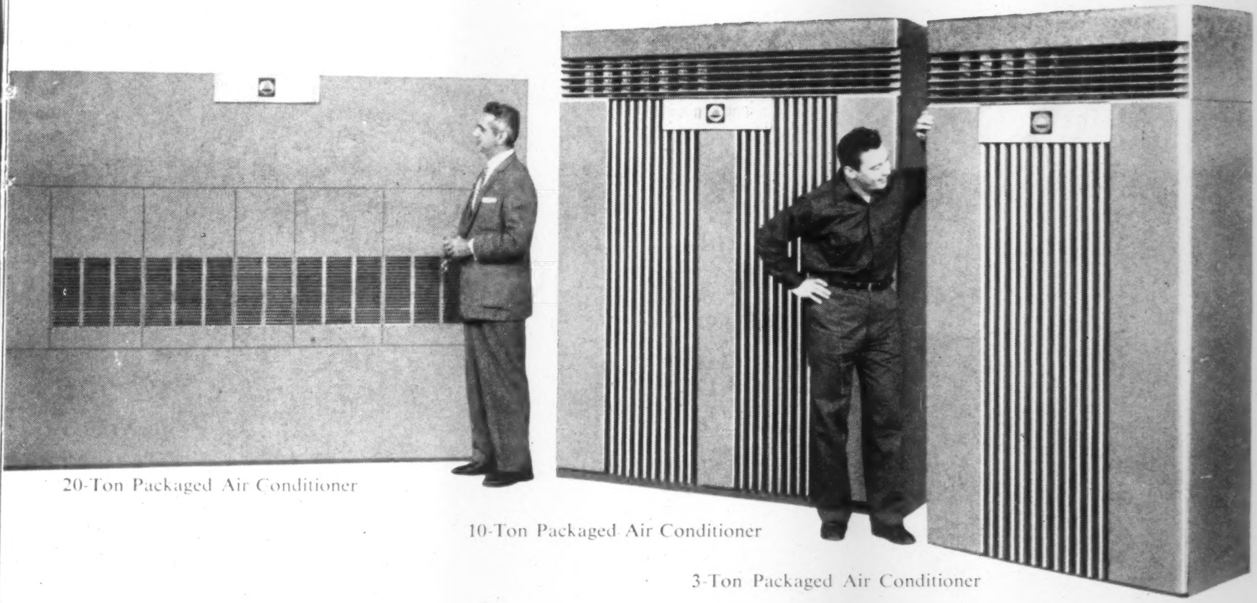
1. Plenum. Minimum height to fit into limited spaces. Outlet grille has horizontal and vertical louvers to control air distribution. No special tools needed for adjustment. Designed for optimum velocity at low fan speeds.

2. Fan. Centerplate construction eliminates turbulence; wheel and housing integrally designed; large outlet area, low-speed operation. Fan size specially selected for each size unit, for peak performance with plenum or duct work.

3. Filter. Permanent-type. Large face area gives maximum cleaning; permits low fan speeds. Low air resistance means more air per horsepower, smaller electric bills. Condensate washes dust, dirt from filter, provides less variation in air flow.

4. Cooling Coils. Copper coils with spiral aluminum fins, sloped and staggered to give greatest air-coil contact. Because air is drawn through coils, not blown through, every square foot of coil is utilized for more cooling capacity.

5. Compressor. Motor and compressor hermetically sealed in rigid casing; spring-mounted to absorb vibration. Require no oiling, adjusting, seasonal pumpdown. Triple-valve design for quietness. Warranted for five years.



20-Ton Packaged Air Conditioner

10-Ton Packaged Air Conditioner

3-Ton Packaged Air Conditioner

Air Conditioners for every business!

Comfort-engineered to condition every corner!

American Blower Comfort-Engineered Packaged Air Conditioners give you *more* cooling with their large-capacity cooling coils — sloped, spiraled and staggered for the greatest air-coil contact possible!

Air passes first through the large, heavy-duty filter where dirt, dust and impurities are removed. Then heat and moisture are extracted as the air is drawn over every square foot of the coil.

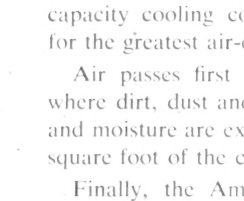
Finally, the American Blower Fan, with exclusive centerplate construction, sends conditioned air through plenum or duct work to every corner of a building. Centerplate construction eliminates turbulence — means even circulation, greater efficiency, smoother, quieter operation.

There's an American Blower Comfort-Engineered Packaged Air Conditioner, in sizes from 3 to 20 tons, to satisfy the air-conditioning requirements of every business — retail stores, showrooms, offices, factories.

If you'd like to become a dealer for American Blower Packaged Air Conditioners — and benefit from American Blower's 75 years' leadership in the air-handling and air-conditioning fields — send for full information today! Write: American Blower Division of American-Standard, Detroit 32, Michigan.

DISTRIBUTORS: Choice territories are still available. Send for franchise data today.

Full Five-Year Warranty

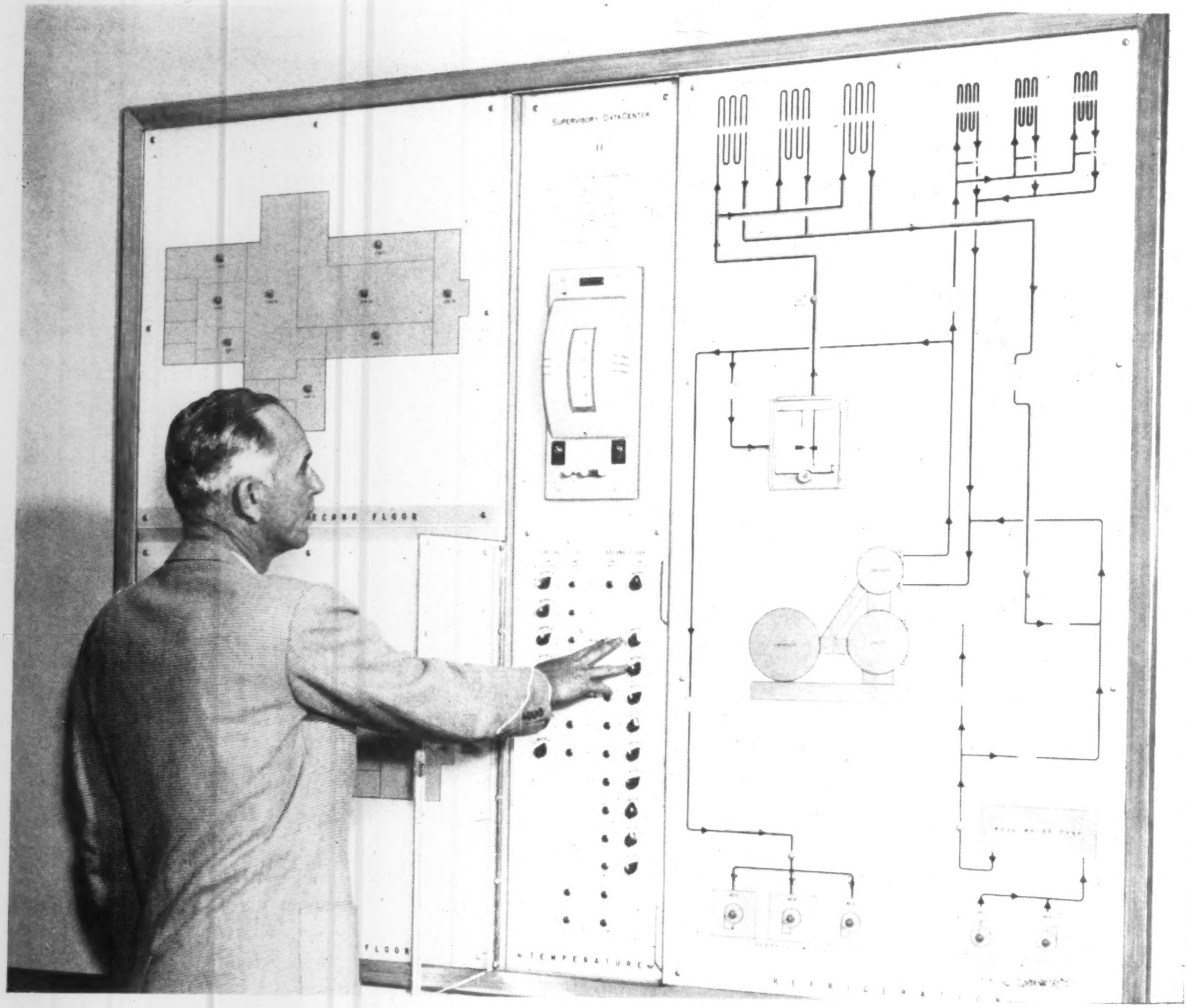


Warranty Certificate

In every American Blower Packaged Air Conditioner, the complete refrigeration circuit, including the hermetically sealed compressor, is warranted for a full five years. In addition, the compressor is permanently lubricated — never needs oiling or seasonal pumpdowns.

AMERICAN BLOWER

Division of **American-Standard**



True Automatic Air Conditioning—

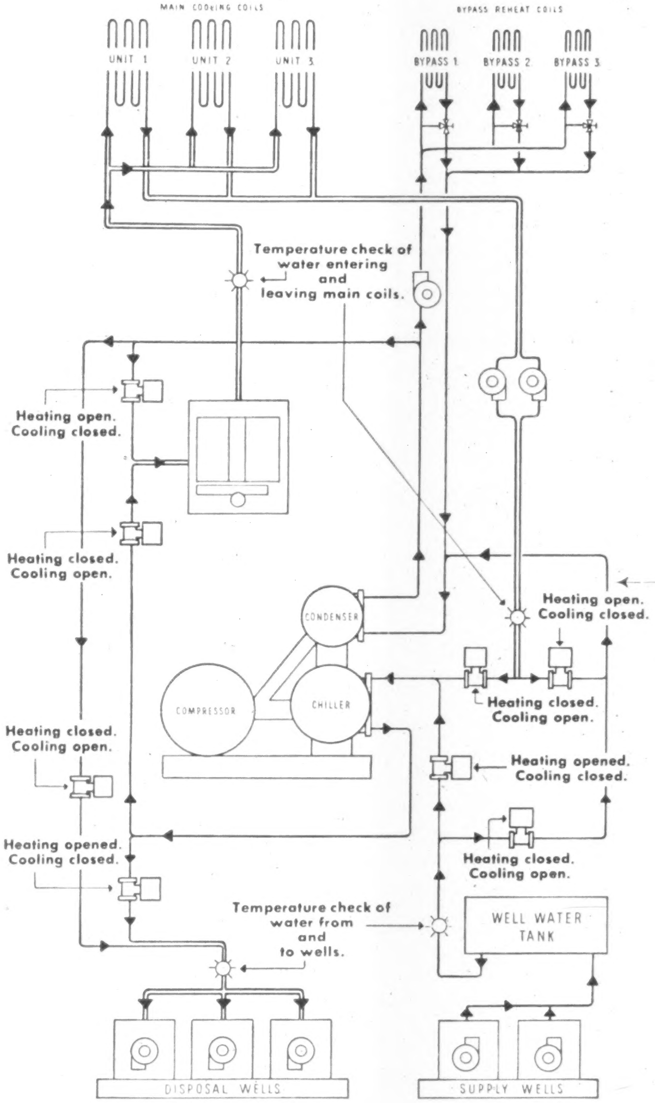
Architect: Eliot C. Fletcher, Tampa;
Engineer and General Contractor:
Stone & Webster Engineering Corporation of Boston;
Air Conditioning Contractor:
Tampa Armature Works, Inc., Tampa

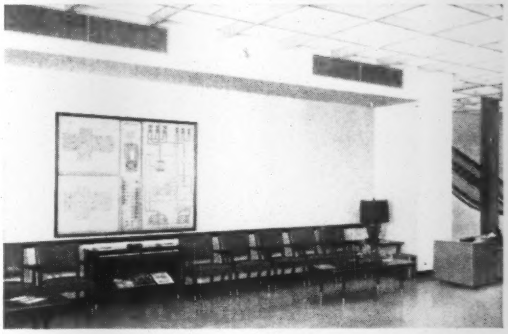
INSTALLATION of the Honeywell Supervisory DataCenter in the new Tampa Electric Company building lobby illustrates well how central control can be used with a 200-ton centrifugal refrigerating system that furnishes both heating and cooling.

Temperatures in 17 large public zones can be read and adjusted quickly at the panel; a locked glass cover prevents tampering.

Individual room thermostats in private offices give each occupant personal temperature selection.

In addition, operation of the entire heat pump system can be checked at any time at the panel. A miniature instrument allows output of the refrigeration compressor to be noted and adjusted.


MAIN COOLING COILS
UNIT 1
UNIT 2
UNIT 3
BYPASS REHEAT COILS
BYPASS 1
BYPASS 2
BYPASS 3
Temperature check of water entering and leaving main coils.
Heating open. Cooling closed.
Heating closed. Cooling open.
CONDENSER
COMPRESSOR
CHILLER
Heating open. Cooling closed.
Heating closed. Cooling open.
Heating closed. Cooling open.
Heating opened. Cooling closed.
Heating opened. Cooling closed.
Heating closed. Cooling open.
Temperature check of water from and to wells.
WELL WATER TANK
DISPOSAL WELLS
SUPPLY WELLS



New use for electric power—heating and cooling with a heat pump—is demonstrated dramatically by prominent display of the Supervisory DataCenter control panel in the lobby of the Tampa Electric Company building.

Heat pump operation. Tampa Electric Company heat pump system has three water circuits. (1) A circuit from the supply wells through the chiller (heating cycle) or condenser (cooling cycle) to the disposal wells. (2) A closed circuit from the main cooling coil to the condenser (heating cycle) or the chiller (cooling cycle). (3) A circuit from the condenser (cooling cycle) to the bypass reheat coils. During cooling cycle, water from the wells passes through condenser where it picks up heat. This warmer water then returns to the disposal wells. Water from main cooling coils is cooled by the chiller in a closed loop. During heating cycle, water from the wells gives up heat in the chiller and this cooler water is returned to the disposal wells. Water from the main coils is heated by the condenser in a closed loop. The difference in the temperature of the water entering and leaving the main cooling coils is a measurement of the heat being removed or added to the circulated air. The difference in the temperature of the water leaving and returning to the wells is a measurement of the amount of heat being removed from or added to the well water. The output of the compressor is controlled by a Honeywell miniature indicating-controller to maintain a temperature of 45° for cooling and 105° for heating of the supply water for the well coils. For further explanation of system operation, refer to notes on diagram at left.

. . . with Honeywell Supervisory DataCenter

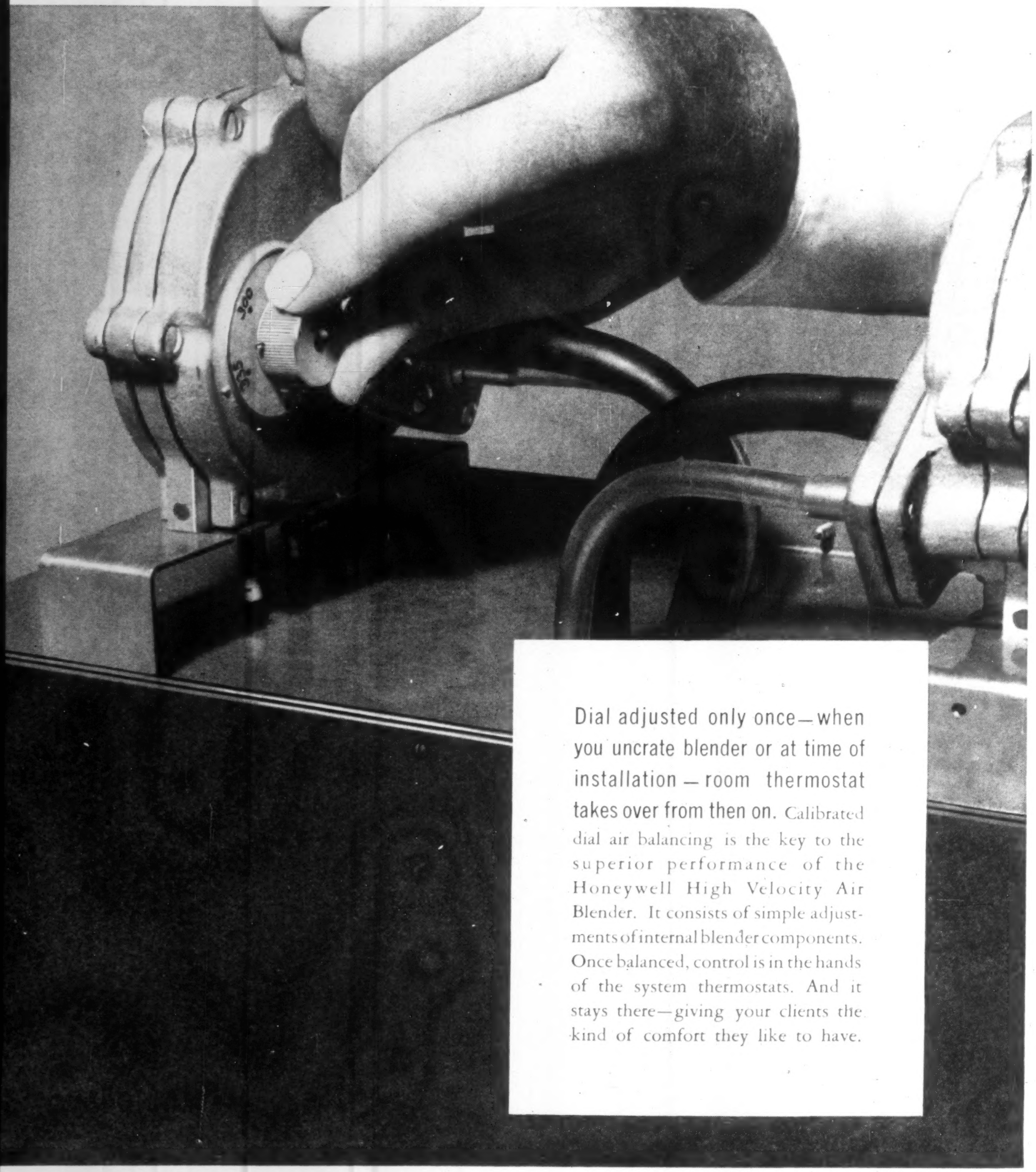
Greater operating efficiency with less personnel time . . . longer equipment life . . . operational savings that liquidate cost . . . attractive display of your engineering design—all this can be accomplished with the centralization made possible by the Honeywell Supervisory DataCenter. More than 100 of these installations are now in operation throughout the country.

All components of the DataCenter are manufactured by Honeywell. And *only* Honeywell manufactures pneumatic, electric and electronic controls and instruments.

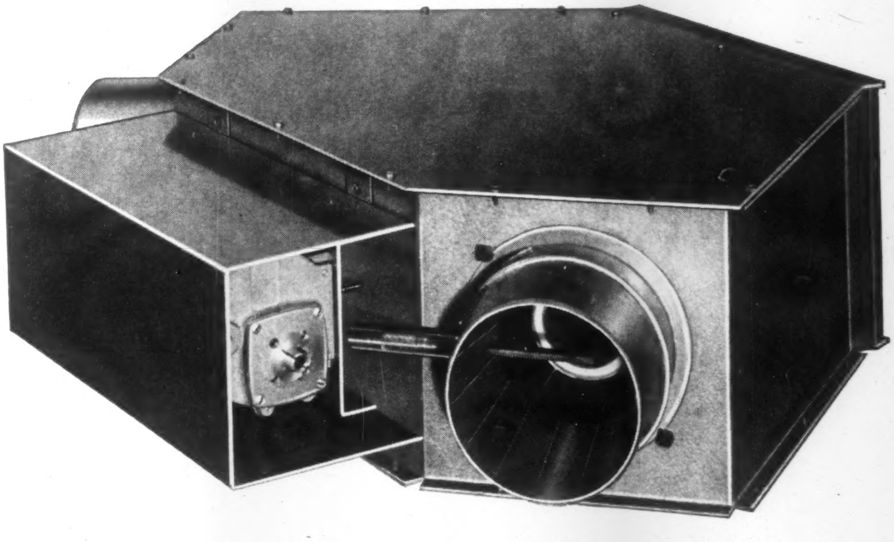
For further information about the DataCenter and other Honeywell control concepts, call your local Honeywell office. Or if you prefer, write to Minneapolis-Honeywell, Dept. HA-4-143, Minneapolis 8, Minnesota.

For news about another
major Honeywell contribution
to air conditioning,
turn the page. ⟶

Control leadership through advanced engineering-research



Dial adjusted only once—when you uncrate blender or at time of installation—room thermostat takes over from then on. Calibrated dial air balancing is the key to the superior performance of the Honeywell High Velocity Air Blender. It consists of simple adjustments of internal blender components. Once balanced, control is in the hands of the system thermostats. And it stays there—giving your clients the kind of comfort they like to have.



How blender works. This is the packaged blender for conventional installation. Other configurations available for special installations. From it, whatever the form, you and your clients can expect controlled volume of air, constant CFM, long valve life and simplified control. The thermostat in the Air Blender System controls temperature by controlling the volume of hot air passed by the hot duct. At the same time a flow regulator provides a constant hot air volume for a given thermostat signal under variations in supply duct pressures. A constant total flow is provided by a total flow regulator which operates the cold air valve to make up the difference between hot flow and desired total flow.

Dial Air Balancing

New Honeywell Air Blender Solves Dual-Duct High Velocity Distribution Problems

Provides constant delivered air volume, needs no recalibration when you add to system

WITH THE new Honeywell Air Blender your clients get the level of comfort they want—on the simple call of the room thermostat.

They get this easily, because the Honeywell Air Blender combines temperature and volume control in one unit.

And comfort doesn't come at the expense of some other room. It comes from the system. *One room no longer "robs" another of comfort.*

Besides providing constant delivered air volume, the Honeywell Air Blender takes well to change. With Dial Air Balancing you can add to the system without having to recalibrate distribution points that may be scattered widely—especially valuable in floor by floor modernization or on new construction.

Self-powered, the Honeywell Air Blender uses the air pressure of the high velocity air it is controlling to actuate the diaphragm—its only moving part. Such simplicity makes possible long life and trouble free performance.

For further information about the Honeywell High Velocity Air Blender and other Honeywell heating and air conditioning products, call your local Honeywell office. Or write to Honeywell, Dept. HA-4-143, Minneapolis 8, Minnesota.

Room thermostat—
the Honeywell Round

The "new" look in thermostats that's appearing on walls of commercial buildings throughout America. New design *inside* gives closer control, vastly superior performance.

MINNEAPOLIS
Honeywell

H HONEYWELL First in Controls

Only Honeywell gives you all four—
pneumatic, electric, electronic, instruments.

John Carroll University specifies **Y**oungstown **S**teel **P**ipe for new Campus Service Building

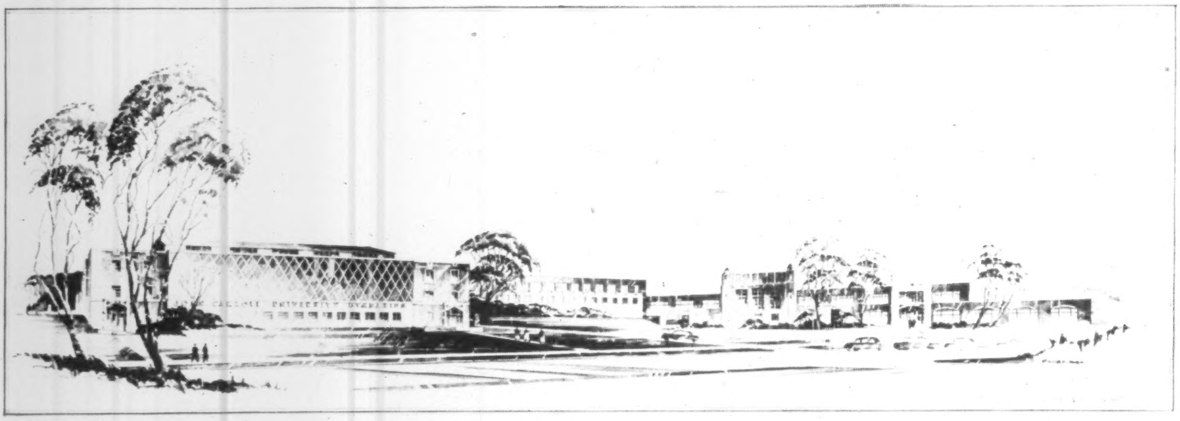
This attractive new Service Building, parts of which are now under construction on the campus of Cleveland's John Carroll University, will contain a Gymnasium, Transportation Hall, Student Activities Center and a Student Dining Hall. To coordinate all the structure's physical functions, the University and its architect specified Youngstown Steel Pipe for its dependability and long life.

Youngstown Steel Pipe is made of only the highest quality steel by steelmen with over 56 years of pipemaking experience. All of Youngstown's fully integrated operations—from iron ore mining to finish pipe threading—are rigidly quality-controlled to provide the best steel pipe available anywhere. Why not make Youngstown your continuing specification for long life and trouble-free installations?

For additional information or service, call your local Youngstown distributor—or contact our nearest District Sales Office, today.

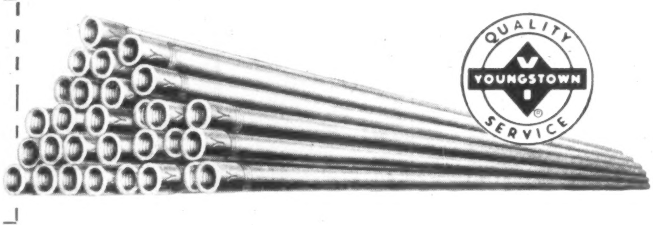
THE YOUNGSTOWN SHEET AND TUBE COMPANY
Manufacturers of Carbon, Alloy and Yoloy Steel
General Offices - Youngstown 1, Ohio
District Sales Offices in Principal Cities

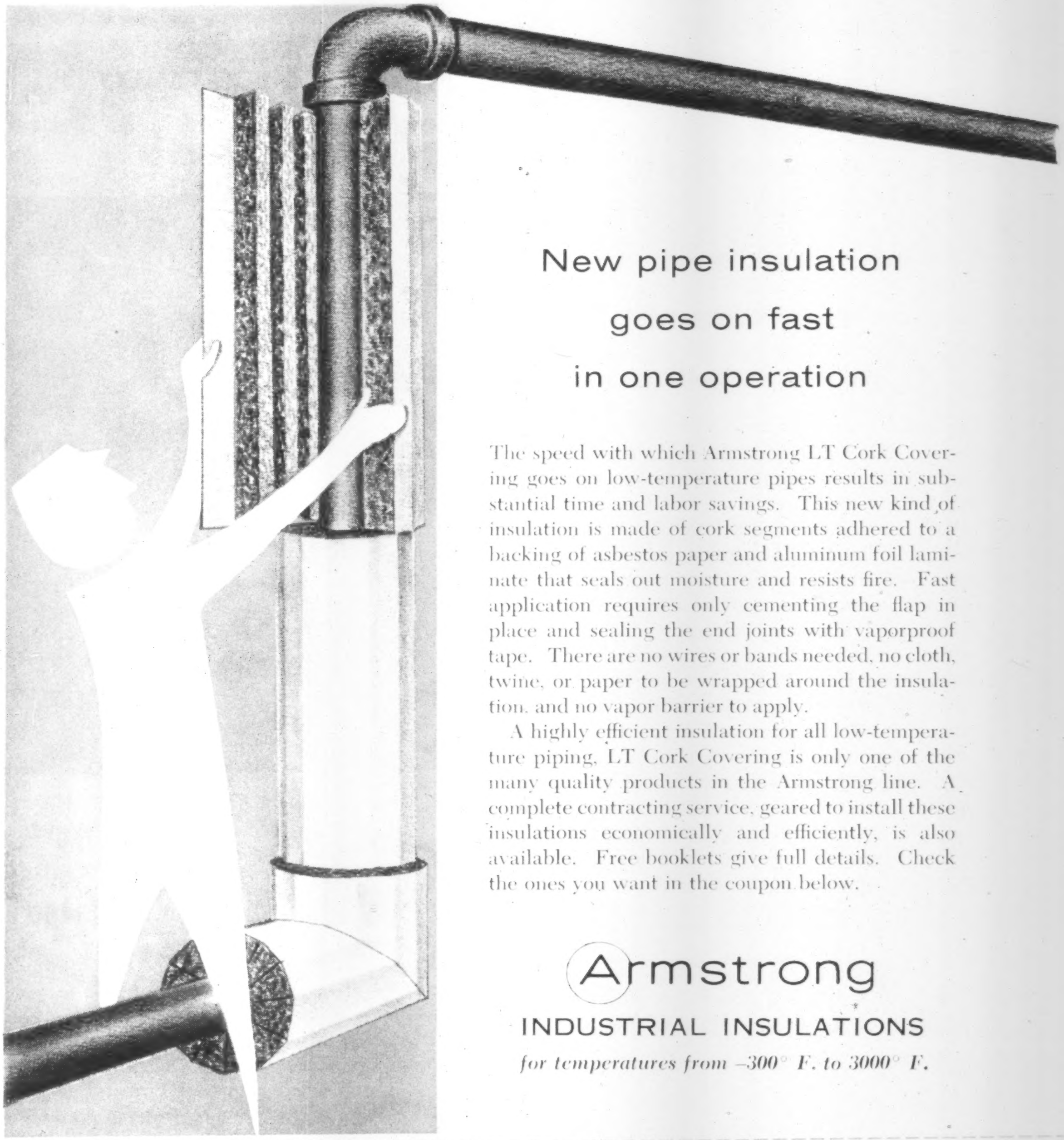
John Carroll University Service Building
Architect: Small, Smith, Reeb and Draz, Cleveland
General Contractor: Roediger Construction Inc., Cleveland
Plumbing & Heating Contractor:
The Gorman-Lavelle Plumbing & Heating Co., Cleveland
Distributor: Grinnell Company, Cleveland



Specify Youngstown and secure these 7 Points of uniform goodness

- uniform ductility
- uniform lengths
- uniform threading
- uniform weldability
- uniform wall thickness and size
- uniform strength and toughness
- uniform roundness and straightness





New pipe insulation goes on fast in one operation

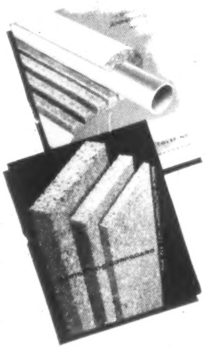
The speed with which Armstrong LT Cork Covering goes on low-temperature pipes results in substantial time and labor savings. This new kind of insulation is made of cork segments adhered to a backing of asbestos paper and aluminum foil laminate that seals out moisture and resists fire. Fast application requires only cementing the flap in place and sealing the end joints with vaporproof tape. There are no wires or bands needed, no cloth, twine, or paper to be wrapped around the insulation, and no vapor barrier to apply.

A highly efficient insulation for all low-temperature piping, LT Cork Covering is only one of the many quality products in the Armstrong line. A complete contracting service, geared to install these insulations economically and efficiently, is also available. Free booklets give full details. Check the ones you want in the coupon below.

Armstrong

INDUSTRIAL INSULATIONS

for temperatures from –300° F. to 3000° F.



Armstrong LT Cork Covering, for all low-temperature lines.

Armstrong Corkboard, for all low-temperature rooms

Armstrong ARMALITE

Armstrong Armaglas* Insulations, for low-temperature rooms

☐ Armstrong Armalite†, a new, lightweight insulation for cold rooms

† Trade-Mark

Armstrong Cork Company
2004 Sherman Street
Lancaster, Penna.

Please send me the free booklets checked.

Please have an Armstrong representative call.

Name ....

Position ....

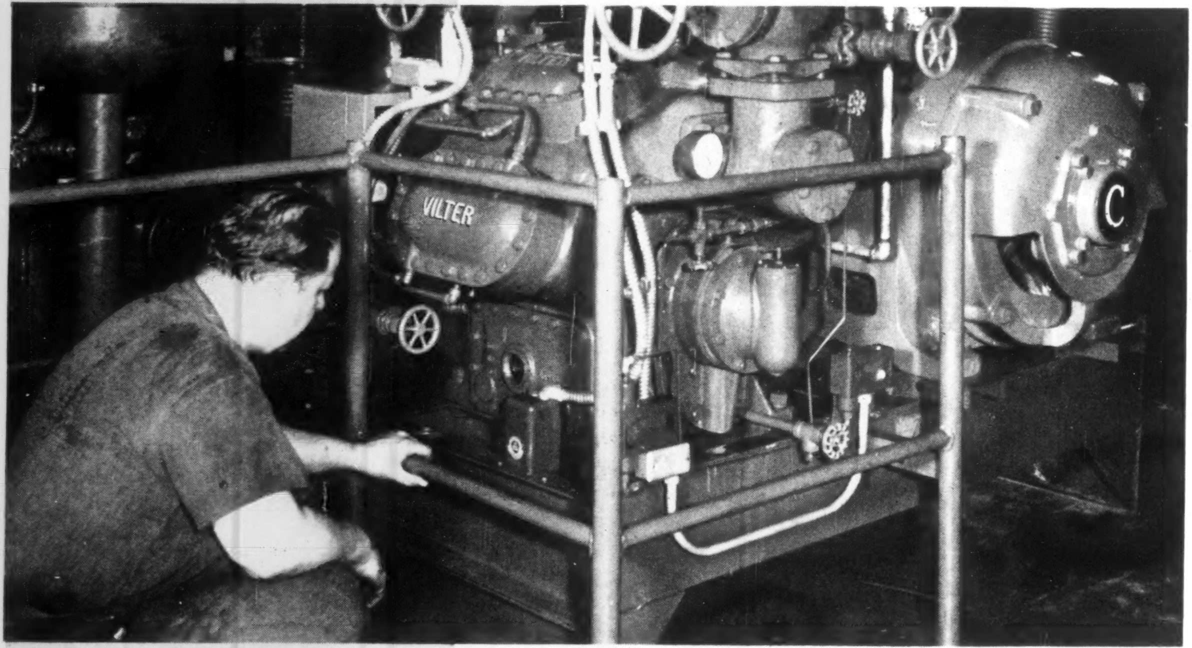
Company ....

Address ....

City .... **Zone** .... **State** ....

* ® Armstrong Cork Company, manufactured for Armstrong by Owens-Corning Fiberglas Corp.

Get the power you need for smooth, swift compressor operation with



100 HP Century Performance-Rated type SCH Motor drives 4-stage compressor in air conditioning installation at large hotel.

Century Performance-Rated© MOTORS

Century has the motors you need . . . Performance-Rated to your *specific* applications! Here, a Century motor smoothly delivers the power for efficient compressor operation . . . with swift and easy acceleration from rest to full speed. Quiet starting and running characteristics; and where starting current must be limited, they are connectible for part winding starting. Available up to 400 HP.

You can get Century Performance-Rated Motors to fit the precise requirements of your installations: for compressors, circulating pumps, cooling towers, fans, blowers, stokers, etc. Sleeve or ball bearing; wide range of torque, speed, mountings, frames. Call or write your nearby Century District Sales Office or Authorized Distributor.

Performance-Rated© MOTORS 1/20 to 400 H.P.

CENTURY ELECTRIC COMPANY

1806 Pine Street • St. Louis 3, Missouri • *Offices and Stock Points in Principal Cities*

79

YOUR BIGGEST AIR CONDITIONING PROBLEM:

*Rising prices! Cost per cubic foot of air conditioning ducts and building space has tripled since 1930!**

YOUR MOST URGENT AIR CONDITIONING NEED:

An air handling unit which meets all design and functional objectives yet requires only a minimum amount of space!

YOUR BEST AIR CONDITIONING SOLUTION:

New WORTHINGTON central station units that offer unlimited choice of location!

FREE DATA BOOK!
Gives you all the facts to figure the job with the most compact, adaptable air handling units ever developed!

WORTHINGTON
Air Conditioning Units
Central Station Cabinet Type
Model CV and CH
Vertical and Horizontal
WORTHINGTON

Included are photos of units, engineering and design features, specifications, physical data . . . *plus*

Direct Expansion Coil Data • Selecting the Correct Unit with Direct Expansion • Sample Water Cooling and Water Heating Problem • Psychrometric Chart • Heat Control of Dry Air • Log Mean Temperature Chart • Mean Effective Temperature Tables • Correct Fan Selection—Sample Problem and Fan Data • Dimensional Drawings

This fact-filled, easy to use Worthington 52-page Data Book is a "must" for every architect, engineer, contractor and builder! Send for your copy today.

*Architectural Record, May 1956.

WORTHINGTON

CLIMATE ENGINEERS TO INDUSTRY, BUSINESS AND THE HOME

CLIP COUPON AND MAIL!

WORTHINGTON CORPORATION
Box 35
Kearny, N. J.

Please send me free copy of Worthington's new booklet on Central Station Air Conditioning Units.

Name ____________________ (Please print or type)

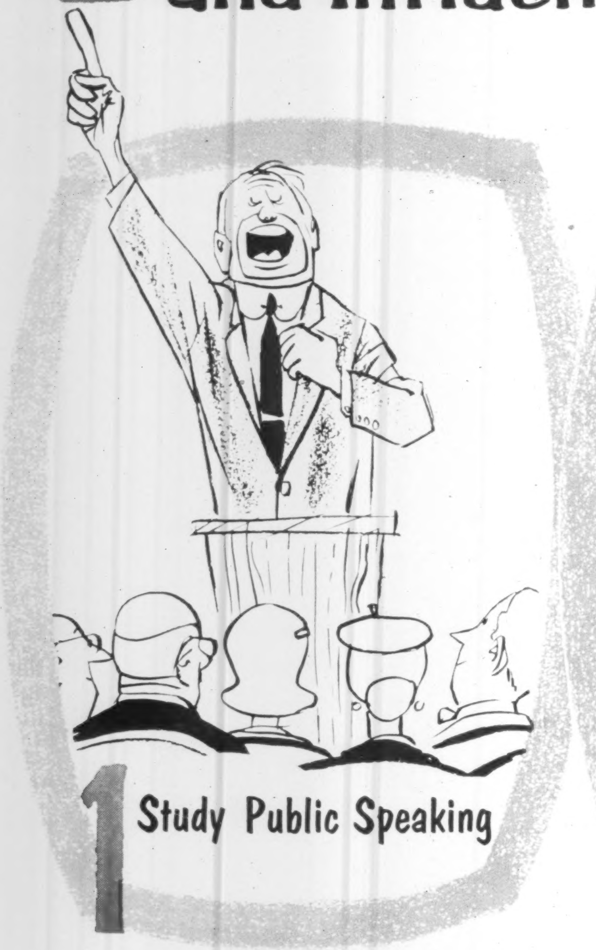
Company ____________________

Street & No. ____________________

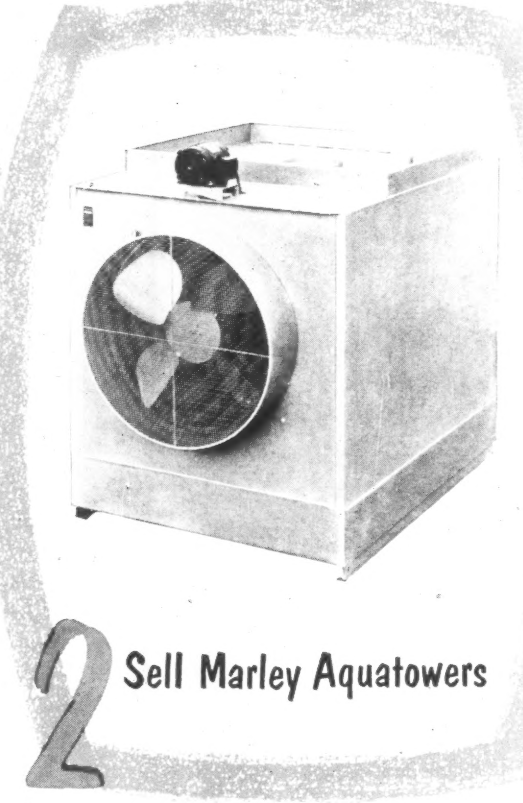
City ____________ Zone ________ State ________

A. 6. 118

2 ways to win friends and influence customers...



1 Study Public Speaking



2 Sell Marley Aquatowers

The contractor who is in business to *stay* knows that consistent and lasting performance in an air conditioning installation speaks louder than words. That's why a majority of successful contractors simply standardize on Marley Aquatowers.

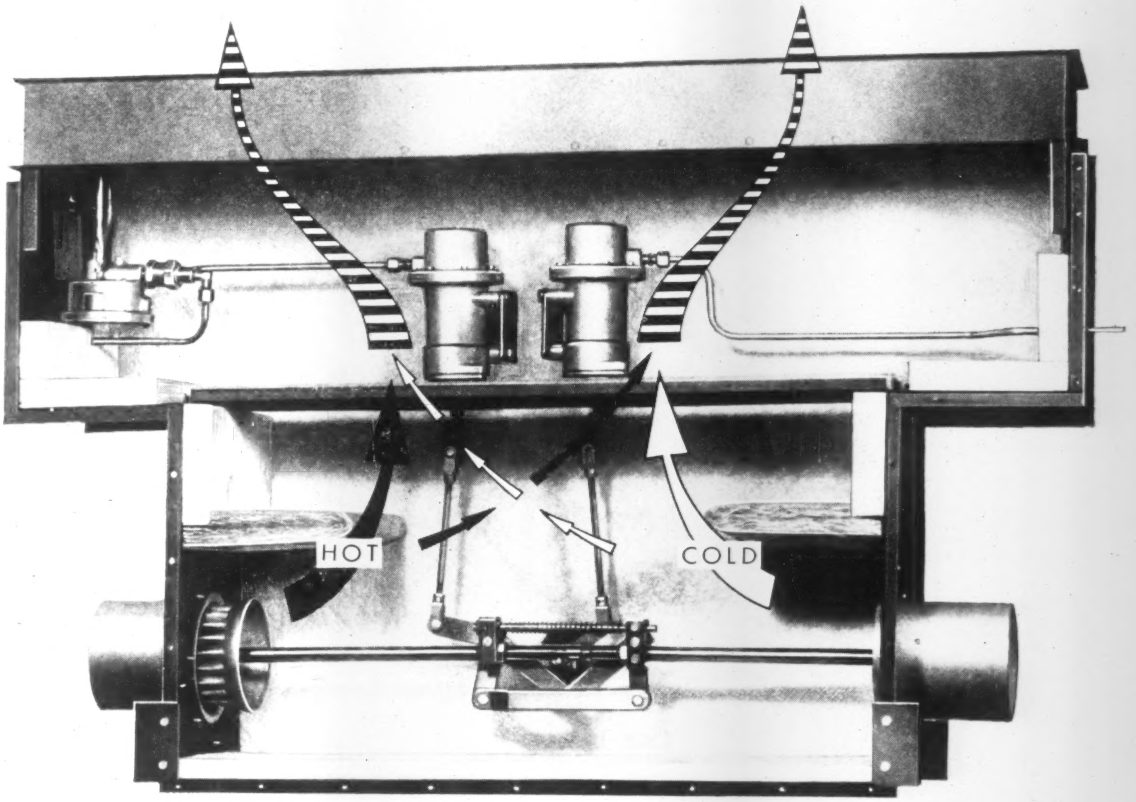
Only in Aquatowers do you and your customers get the benefit of 35 years of cooling tower engineering and production know-how —*plus* heavy steel casing . . . super-tough protective plastic finish . . . more-than-adequate filling . . . plus-performance diffusion deck . . . long-life mechanical equipment that was designed and manufactured just for the tower. Only in Marley Aquatowers do you and your customers receive a guarantee of performance and service that is backed by the world's leading producer of packaged cooling towers for all air conditioning and refrigeration services.

The impression that you make on customers with Aquatowers is a lasting one, for they are the packaged cooling towers with the future (your future) in mind. For information and prompt delivery see your Marley supplier in any of 300 cities . . . soon!

MARLEY

The Marley Company Kansas City, Missouri

How **ANEMOSTAT**®
All-Air Constant Volume High Velocity units operate



Here is a vitally important advance in the field of air distribution. Anemostat All-Air High Velocity units, *with new simple automatic controls*, deliver constant volume, no matter what the fluctuations from 1:4 or 4:1 on inlet pressures of either the hot or cold valve

Each unit is a single package including the controls and integral thermostats, if required. There is complete accessibility of all controls through removable diffusers. No access panels are required. Capacities of CONSTANT VOLUME units can be pre-set at the factory.

These Anemostat CONSTANT VOLUME units

- Assure scientific draft-free distribution of air.
- Are available in 100% induction units.
- Include Anemostat die-cast metal rocket-socket valves. More than 50,000 of these valves are in service, and not a single one has needed maintenance.
- Operate on standard 15 lb positive acting compressed air systems.

Each unit contains a micropressure regulator in the box, sensitive to .02 static pressure. This in turn operates a pneumatic motor and independently maintains by adjustment constant volume, while the wall mounted or integral thermostat controls the outlet mixture temperatures.

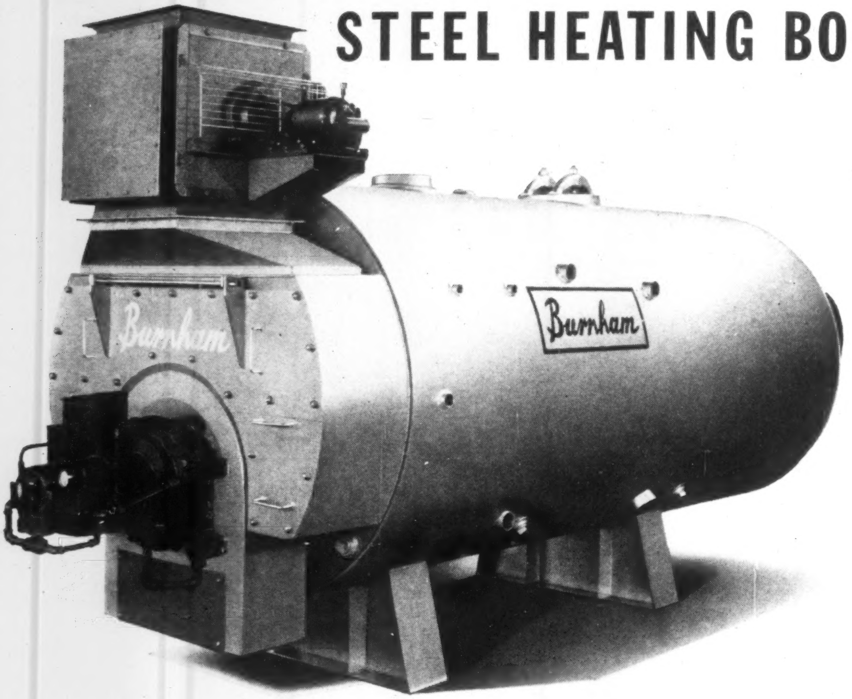
Write on your business letterhead for your copy of

New Anemostat Selection Manual 60

to Anemostat Corporation of America,
10 East 39 Street, New York 16, N. Y.

ANEMOSTAT: The pioneer of All-Air Velocity Systems

New BURNHAM SCOTCH TYPE STEEL HEATING BOILERS



Here are all-new Scotch Type Steel Heating Boilers that conform fully to S.B.I. ratings and low pressure A.S.M.E. Boiler Code Construction. Burnham engineers and craftsmen highly experienced with steel boilers have designed, built and tested them to fulfill the finest standards of the industry.

Here are some of their features:

1. Capacities from 4,000 to 35,000 sq. ft. E.D.R. steam and 6,400 to 56,000 sq. ft. E.D.R. water S.B.I. Net Ratings.

2. Easy-to-open hinged clean-out doors both front and rear.

3. Seven Washout Openings: four in lower perimeter quadrant (both sides), two in lower Front Head, one in Rear Head, all with 2" brass plugs.

4. All needed openings for Oil Heater, Aquastat, etc.

5. Extra combustion volume where gases pass from Furnace Tube into Boiler Tubes for greater efficiency.

6. Dry Back — Wet Top Boilers to eliminate mud and scale accumulation problems, promote complete secondary combustion.

7. Readily adapted to induced or forced draft combustion units to make a scotch type package for oil, gas or combination oil-gas firing.

8. Tankless or Storage Coils for domestic hot water in a wide range of capacities.

Burnham RADIANT HEATING SINCE 1873

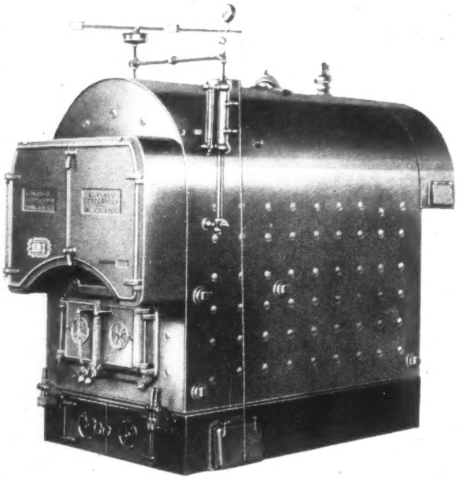
Burnham Corporation

SBI

STEEL BOILER DEPARTMENT
IRVINGTON, NEW YORK

Burnham Corporation **Steel Boiler Department** **Irvington, New York**	**HP-47**
Please give me full data and ratings on	
☐ **SCOTCH TYPE BOILER**	☐ **COMPACT BOILER**
Name	
Address	
City	State ....

BURNHAM COMPACT TYPE STEEL HEATING BOILERS

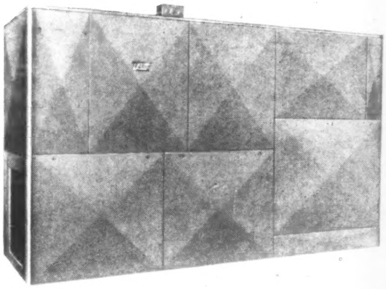


These welded steel boilers are available in capacities from 2,600 to 35,000 sq. ft. E.D.R. steam and 4,680 to 56,000 sq. ft. E.D.R. water, net S.B.I. Ratings. These boilers compress the highest heating capacity into the smallest floor space that can be practically achieved. Fire travel three times the length of the boiler through fire box and heavy gauge 3" tubes gives low flue temperatures, high boiler efficiency and low fuel cost.

Stock Boilers available for prompt shipment

BOHN *Presents*

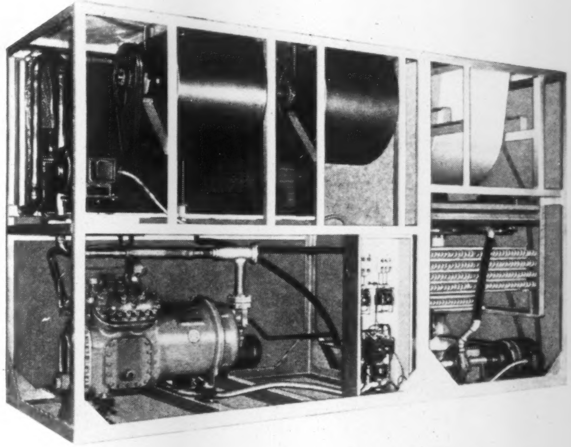
the NEW ANGLE in
Industrial Air Conditioners



Here is the completely packaged air conditioning unit for industrial or large commercial installations . . . with easily-accessible conditioner, compressor, condenser, and filter sections . . . completely engineered, assembled and tested in the factory.

easy installation

minimum operating expense



WITH BUILT-IN WATER SAVERS

- Semi-hermetic compressor
- All motors internally mounted
- Insulated conditioner section
- Bearings fed from outside oil cups
- Efficient quiet blowers, dynamically balanced
- 2-stage counter-flo type condenser, all prime surface
- Easily accessible electric control panel built into compressor section
- Heavy gauge bonderized steel cabinet with rigid access panels, easily removed
- Welded and braced structural steel angle frame, coated with rust-resistant primer
- Condenser blower, eliminator, spray tree and water pan—*all hot-dip galvanized after fabrication*

Models range from 5 through 60 H.P. and are available with standard steam, non-freeze steam or hot water heating coils, face and by-pass dampers, capacity control, increment starter and vibration rails.

For complete detailed information write today for free BULLETIN NO. 3000.

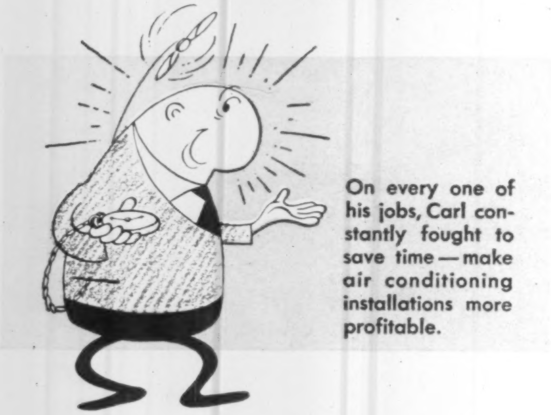
BETZ DIVISION
BOHN
DANVILLE, ILLINOIS

Manufacturers of Commercial Refrigeration, Industrial Air Conditioning and Special Heat Transfer Surface

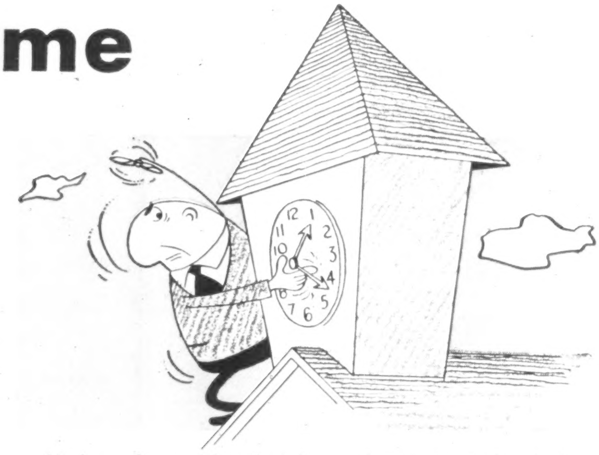
BOHN ALUMINUM & BRASS CORPORATION • BETZ DIVISION • DANVILLE, ILLINOIS

HOW *Cool Carl* the Competent Contractor

Saved Time



On every one of his jobs, Carl constantly fought to save time — make air conditioning installations more profitable.



He knew he couldn't do it by . . . Setting back the clock

He knew he couldn't do it by . . . Impractical shortcuts

He knew he couldn't do it by . . . Adding more help

Then he found the best possible solution . . . he specified

Allis-Chalmers Air Conditioning PUMPS

Cool Carl really saved time when he and the consulting engineer specified Allis-Chalmers!

1. He saved engineering time — the Allis-Chalmers pump representative knew his stuff, helped select just the *right* pumps.

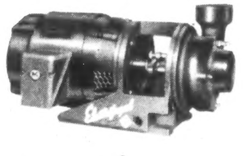
2. He saved installation time — to install the compact A-C unit, all Carl did was bolt down the base . . . then connect power, piping and ground.

3. He saved service time — the many extra-quality features of A-C pumps slashed Carl's call-backs.

You'll save time too by specifying A-C pumps. Contact your nearby Allis-Chalmers representative or distributor, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

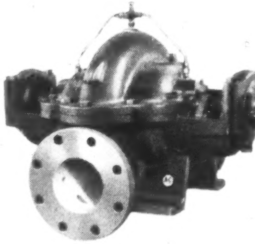
Fractional and Integral Horsepower

pump line has capacities to 2500 gpm, heads to 400 feet.



Other Types of Pumps

by Allis-Chalmers can provide heads up to 550 feet and capacities to 2500 gpm. Various models available cover 99% of all air conditioning applications.



Electrifugal is an Allis-Chalmers trademark.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

A-5227

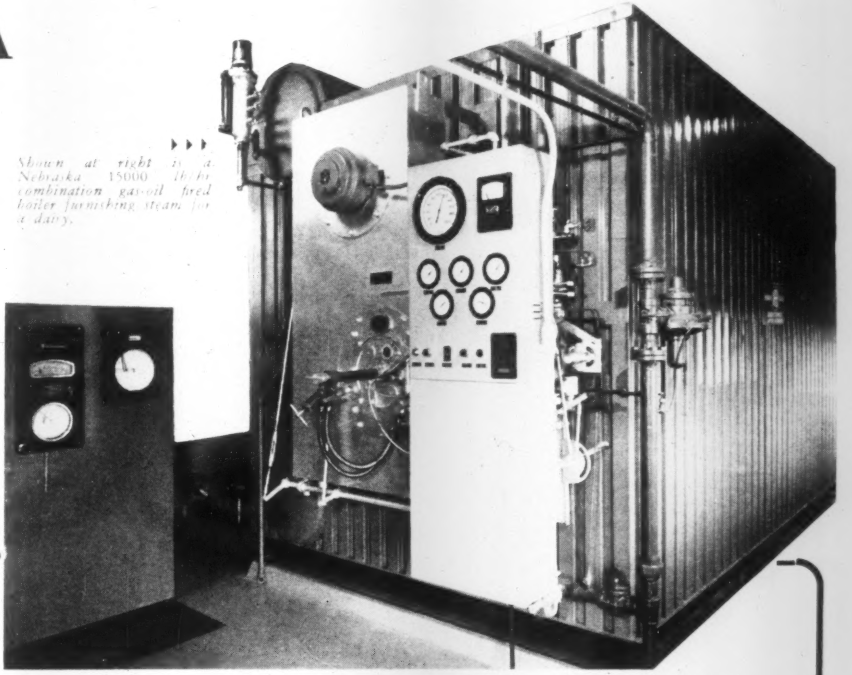
BIG WATER TUBE BOILER PERFORMANCE

. . . in a Package Boiler!

NEBRASKA BOILERS are "Made For The Job"

▸▸▸

Shown at right is a Nebraska 15000 lb/hr combination gas-oil fired boiler furnishing steam for a dairy.



There are some territories presently open for distributors. Please ask for more details.

When you specify a boiler for any application, you must be sure it will perform safely, economically, reliably, and with your customers complete satisfaction the ultimate goal. You have this assurance when you specify Nebraska Boilers.

Nebraska Boilers will operate year in and year out well beyond the manufacturer's warranty or guarantee with an absolute minimum of attention beyond normal service.

It will pay you to investigate the full Nebraska line . . . drop us a note today for more information.

. . . Check these six points of superiority . . .

1. **A Complete Steam Boiler Package**
   Factory assembled, tested and shipped, from one dependable source.
2. **Fully Automatic Operation**
   Gas, oil, or combination fuels. Forced, or induced-draft available.
3. **Sizes to 3000 lb/hr of Steam**
   18 models with standard design pressures up to 160 psi — higher if necessary.
4. **Dependable Burner, Control Systems**
   Utilizes burners, combustion control equipment, flame failure safeguards etc. with national distribution and service.
5. **ASME Code Construction**
   . . . assures dependability. No moving parts, low heat release rates. Constant reliable steam generation.
6. **Ample Reserve Capacity**
   Quick start-up, fast response to load changes, and economy of operation are built right into every Nebraska Boiler.

Nebraska Boiler Company, Inc., Lincoln, Nebraska

FANCY-FREE FAN: *IM-pak

IM-pak CHANGES TO ANY OF 4 POSITIONS—WHILE IN PRODUCTION! "Fancy-Free" is the word for Utility's new IM-pak Blower with Interchangeable Mounting—but it's fancy-free in a way you'll like! IM-pak's complete flexibility gives you an across-the-board stock that covers up to 98% of blower applications for residential air-moving equipment. The key is the Interchangeable Mounting. The two housing supports and motor mount bracket are shipped unattached to the unit, but with all hardware needed for rapid installation. Simply adjust the angle of discharge to any of *four* positions, and quick as a wink, the job is done. No oil cup problems, due to IM-Pak's sealed ball bearings; and the blowers are also available with a specially designed interchangeable sleeve bearing mount which is easily adjustable and permits time-saving production-line switches. IM-pak is sufficiently fancy-free to adapt to your manufacturing needs—without top-heavy inventories of blowers or many unassembled parts. Of course it has all of Utility's famed quality engineering built right in . . . quality that complements the excellence of your own equipment. Proof again that—*YOU CAN'T MATCH UTILITY FOR PRODUCT AND PRICE!*

*INTERCHANGEABLE MOUNTING

A Division of Utility Appliance Corp.

UTILITY FAN CORP. *911 East 59th Street, Los Angeles 1, California*

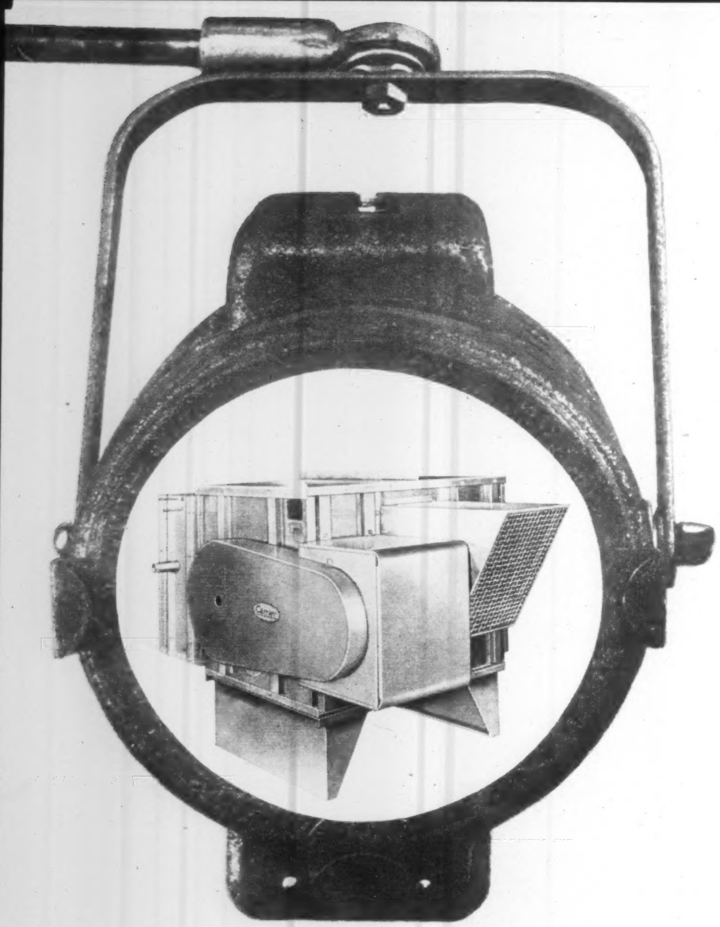
MANUFACTURERS OF HEAVY AND STANDARD DUTY BLOWERS FOR HEATING, AIR CONDITIONING AND VENTILATING INSTALLATIONS. PRODUCERS OF BLOWERS AND BLOWER PARTS FOR ORIGINAL EQUIPMENT MANUFACTURERS. WRITE FOR CATALOGUE DATA.

TURNS THE SPOTLIGHT ON ITS NEWEST 4

for air conditioning · refrigeration · heating

1. NEW AIR COOLED CONDENSERS
2. NEW EVAPORATIVE CONDENSERS
3. NEW HERMETIC REFRIGERATING MACHINES
4. NEW BOILER-BURNERS

Please turn the page →



TWO NEW WAYS TO SAVE WATER

1. NEW CARRIER AIR COOLED CONDENSERS

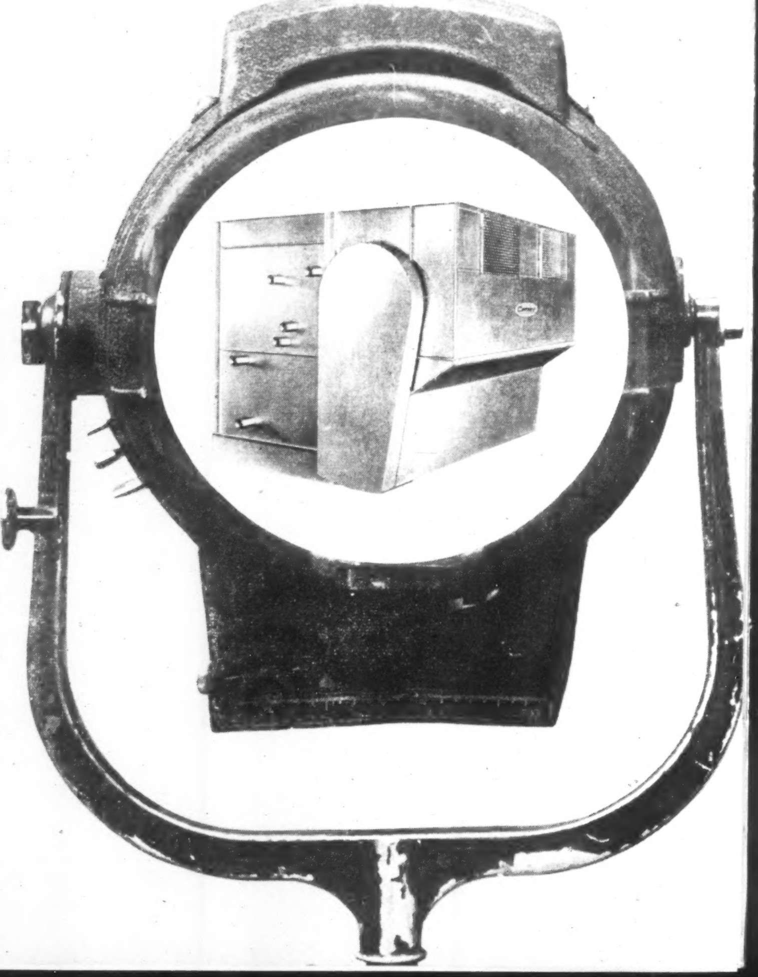
- Handle refrigeration loads from 2 to 38 tons, yet new casing design is more compact
- Low-silhouette casing ideal for installation on roof-tops or in areas with low headroom
- Condenses Refrigerants-12, -22 and Carrene-500

One of Carrier's new air cooled condensers can handle loads that would normally require several propeller-fan condensers. Special coil, with 14 aluminum fins per inch of tubing, and centrifugal fan combine to produce this high-capacity performance. Coil provides more heat transfer surface in less space. Fan draws air evenly across coil, utilizes its full capacity. Quiet centrifugal fan has ample power to move air through ductwork, makes this new Carrier condenser ideal for indoor installations. Can be floor or ceiling mounted. Provides vertical or horizontal air delivery indoors, horizontal only outdoors.

2. NEW CARRIER EVAPORATIVE CONDENSERS

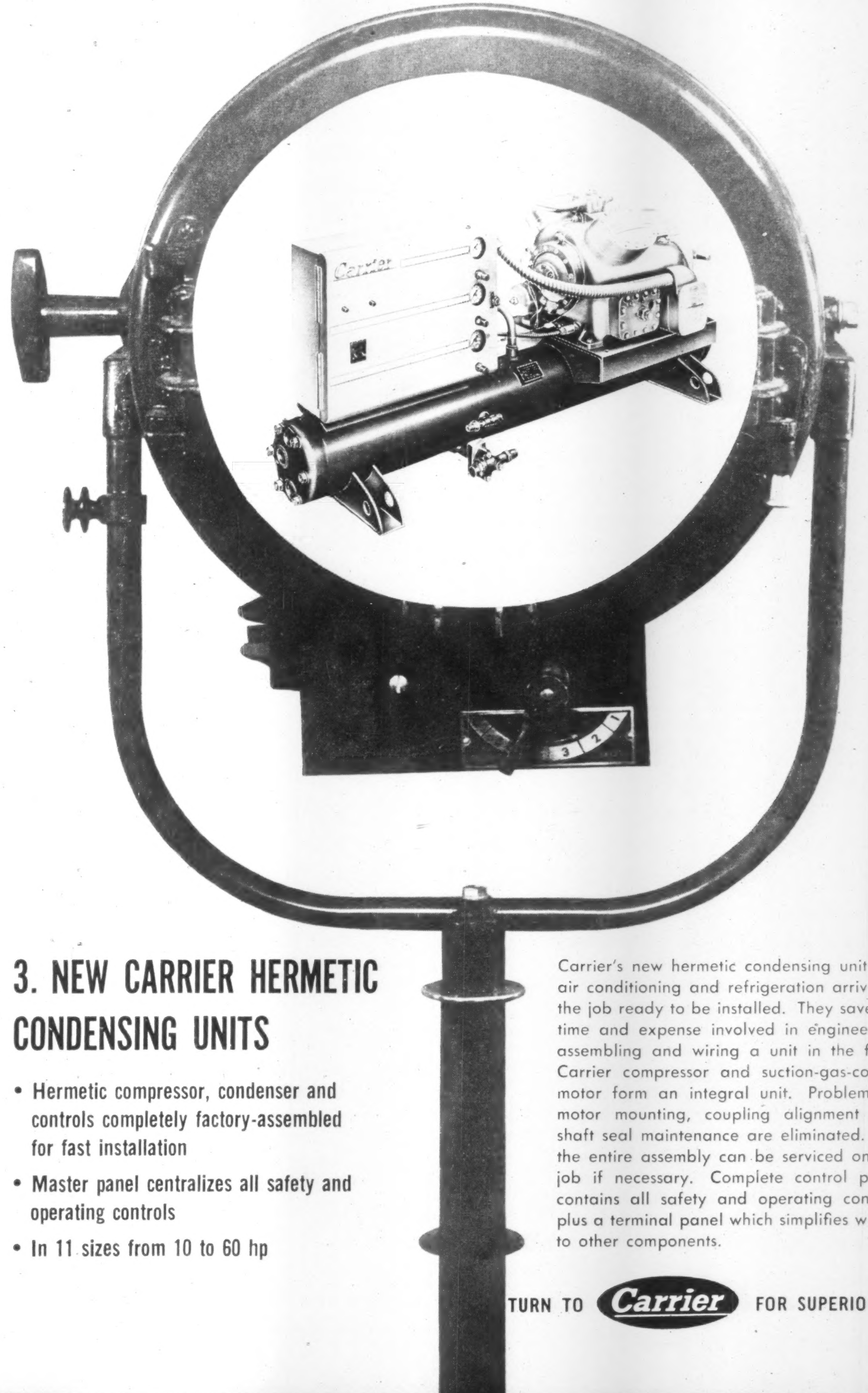
- Exclusive new water distribution method requires no spray nozzles or eliminators
- New condensers weigh less, are lower in height, are easier to service
- Capacity range from 5 to 250 tons

Carrier's new evaporative condensers use a unique water distributing method in which water is pumped to a large pan at the top of the unit. Orifice holes in this pan meter water evenly into a perforated lower pan. This second pan breaks the water into droplets which drench the coil. This simple, effective system ends need for spray nozzles and eliminators, thus cuts maintenance problems. Powerful centrifugal fans draw air quietly across the coil, provide top refrigerating performance.



TURN TO Carrier FOR ADVANCE DESIGN

NEW FACTORY-ASSEMBLED HERMETIC REFRIGERATING MACHINES



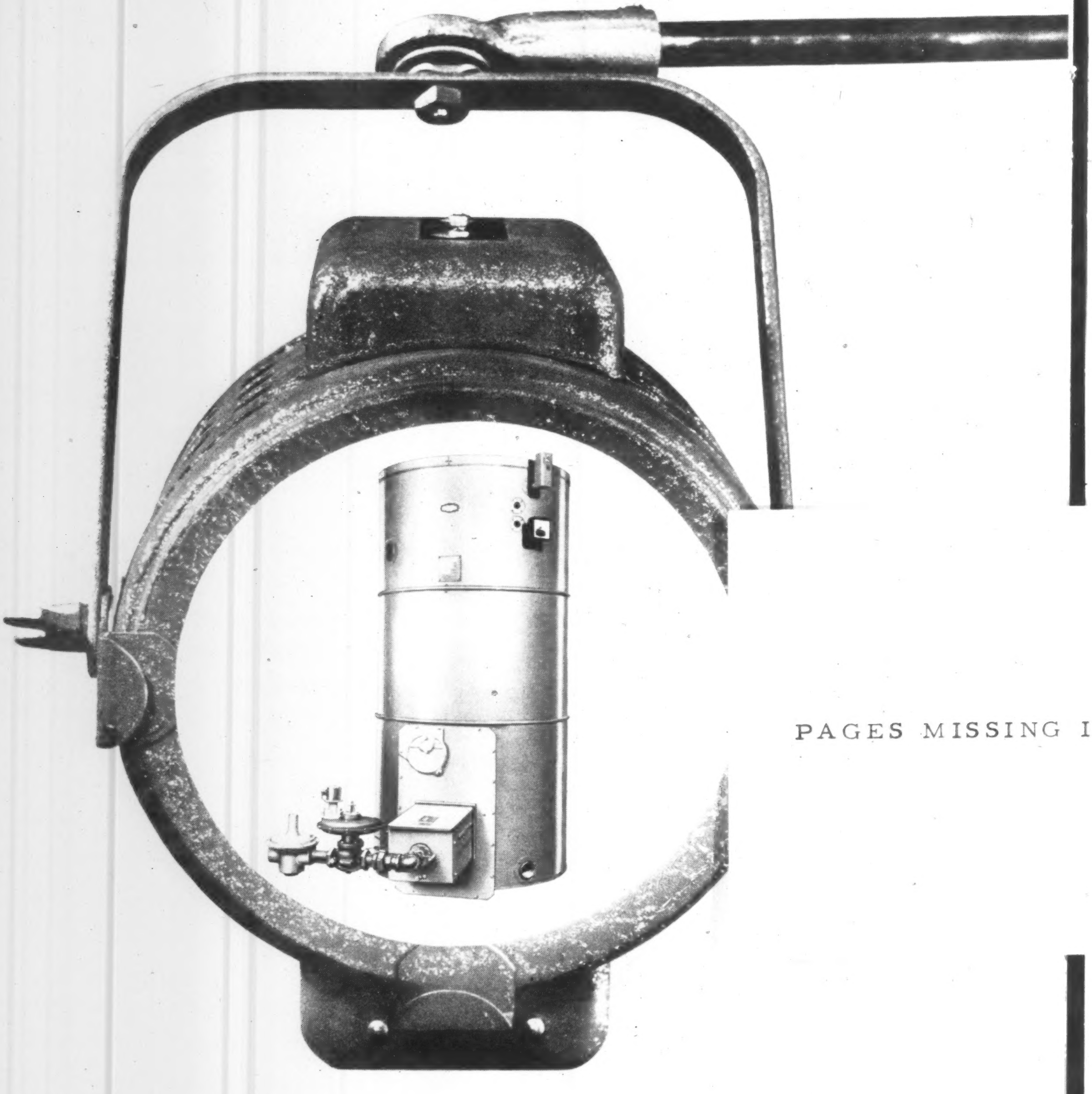
3. NEW CARRIER HERMETIC CONDENSING UNITS

- Hermetic compressor, condenser and controls completely factory-assembled for fast installation
- Master panel centralizes all safety and operating controls
- In 11 sizes from 10 to 60 hp

Carrier's new hermetic condensing units for air conditioning and refrigeration arrive on the job ready to be installed. They save the time and expense involved in engineering, assembling and wiring a unit in the field. Carrier compressor and suction-gas-cooled motor form an integral unit. Problems of motor mounting, coupling alignment and shaft seal maintenance are eliminated. Yet the entire assembly can be serviced on the job if necessary. Complete control panel contains all safety and operating controls plus a terminal panel which simplifies wiring to other components.

TURN TO **Carrier** FOR SUPERIOR PRODUCTS

NEW STEAM OR HOT WATER BOILERS



PAGES MISSING I

4. NEW CARRIER BOILER-BURNERS

- Take up 48% less floor space than horizontal steel or cast-iron boilers of equal rating
- Tested 300% above normal safety requirements of A.S.M.E.—each unit stamped with their symbol
- Gas or oil fired in 11 sizes ranging in net capacities from 81,000 BTU to 810,000 BTU per hour

Now Carrier expands its line-up with new steam or hot water boilers engineered for a long life of safe, economical use in residences and small commercial buildings. They're compact and simple to clean. And their entire design more than meets the rigid requirements of the low-pressure boiler construction code of the A.S.M.E. Each unit is hydrostatically tested at 200 psi, or 300% above normal A.S.M.E. requirements. Each unit is stamped with their symbol. The use of 5/16-inch steel in critical areas is another bonus feature built into new Carrier boilers.

FOR MORE INFORMATION, CALL YOUR Carrier DEALER, LISTED IN THE CLASSIFIED DIRECTORY, OR WRITE

CARRIER CORPORATION, SYRACUSE, NEW YORK

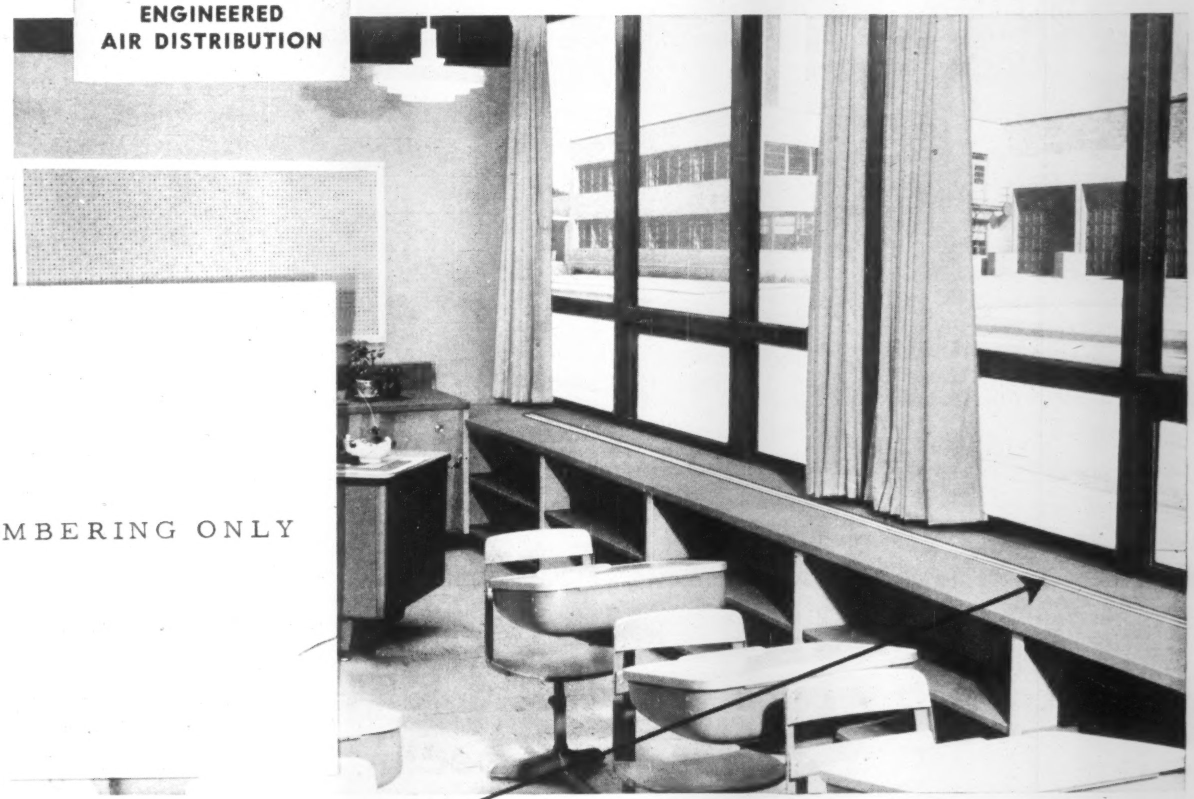
THE MARK OF QUALITY

BARBER COLMAN

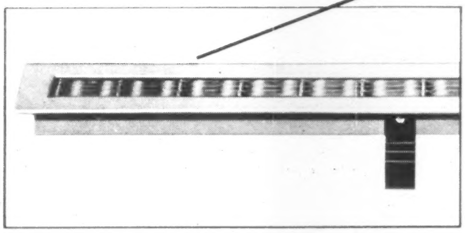
Uni-Flo

ENGINEERED
AIR DISTRIBUTION

"Curtain" of warm air from continuous line diffuser stops cold glass-area drafts



IN NUMBERING ONLY



The new Uni-Flo Model ST Grille is available in increments of 48 inches for continuous line application. Used chiefly on plenum under windows, also applicable as a wall diffuser.

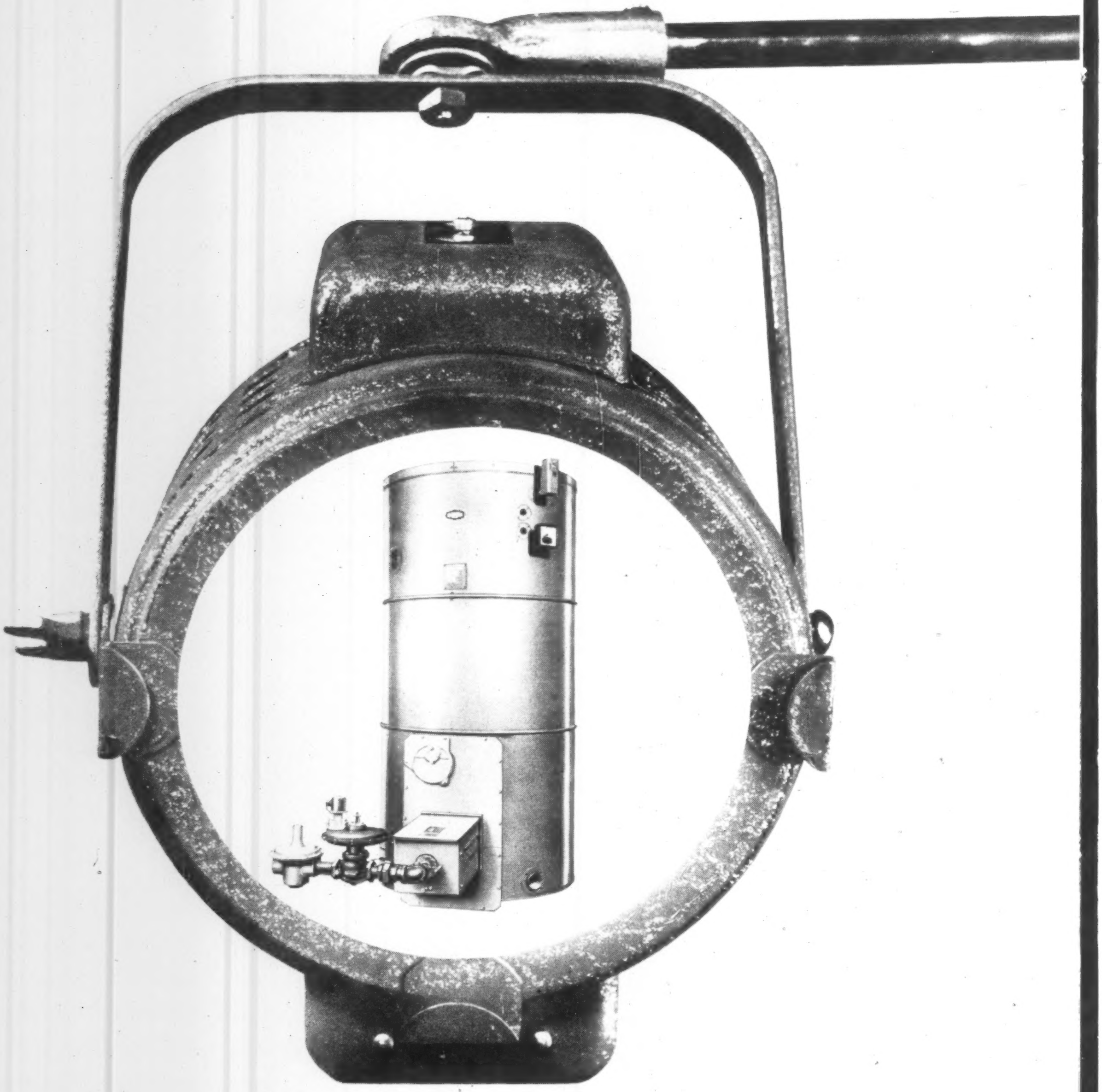
To prevent cold air currents that flow down large glass areas and spill into the room, Barber-Colman Company recommends the Uni-Flo Continuous Line Diffusing Grille. The grille is installed beneath the entire bank of windows, as in the modern schoolroom shown above. Warm air deflected against the chilled window in one continuous "curtain" warms the surface and neutralizes downdrafts. The Continuous Line Diffusing Grille can also be used to provide draft-free distribution of conditioned air for cooling and ventilating as well as heating. Field data is available, and performance of the grilles is guaranteed when they are applied according to published data. Get complete details from your nearby Field Office, or write us today! Only Barber-Colman Company combines skills in both Air Distribution and Automatic Controls for *undivided* responsibility.

BARBER-COLMAN COMPANY

Dept. P, 1101 Rock Street, Rockford, Illinois • Field Offices in principal cities

Air Distribution Products • Small Motors • Automatic Controls • Industrial Instruments • Aircraft Controls • Electrical Components • Overdoors and Operators • Molded Products • Metal Cutting Tools • Machine Tools • Textile Machinery

NEW STEAM OR HOT WATER BOILERS



4. NEW CARRIER BOILER-BURNERS

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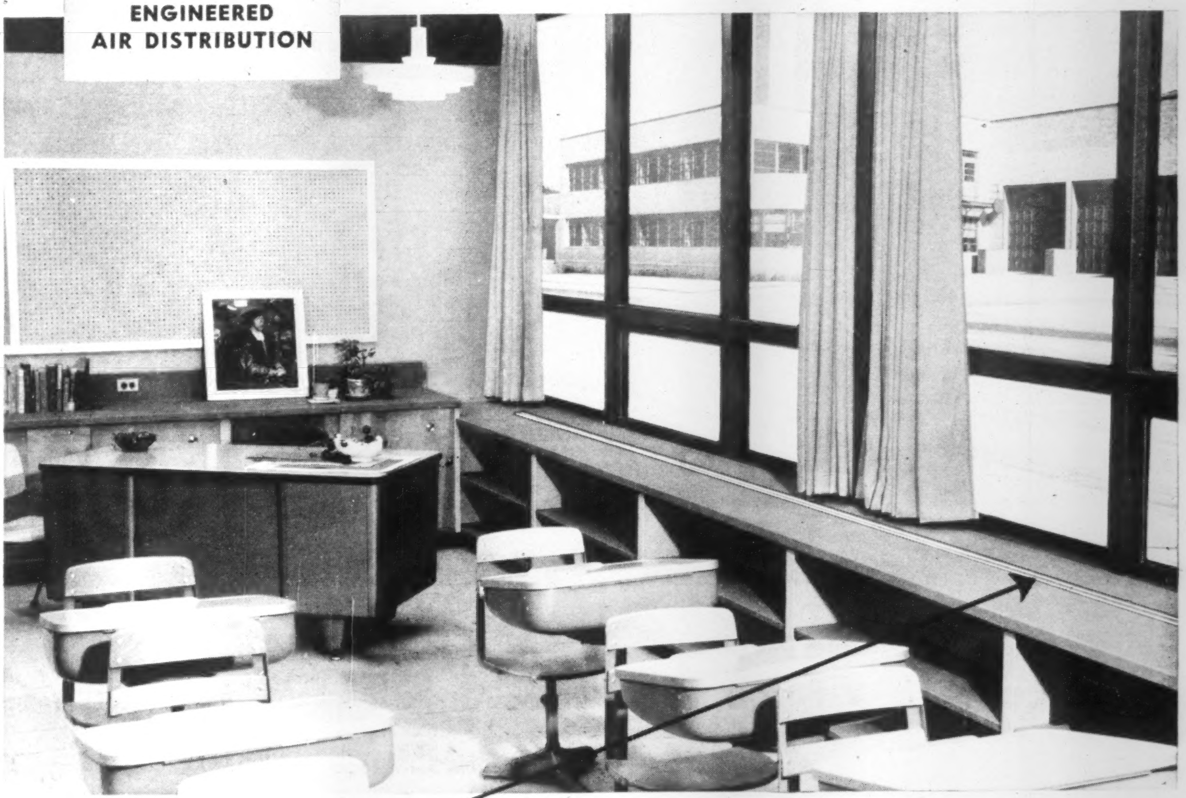

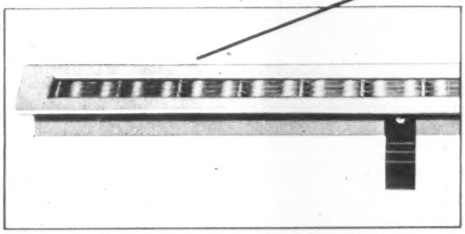

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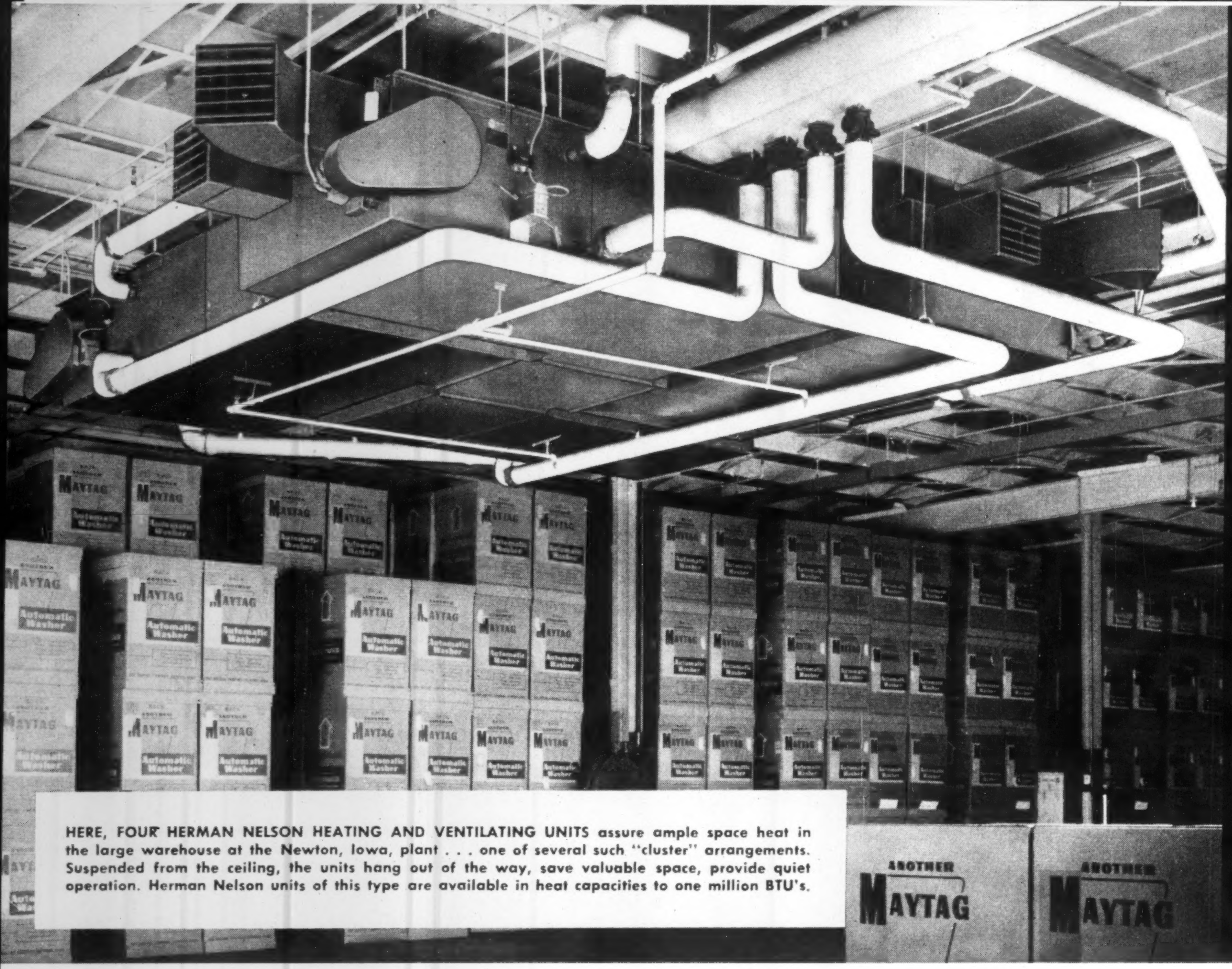
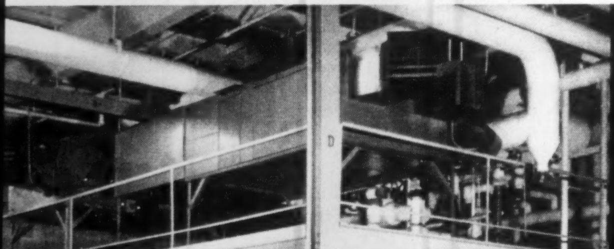


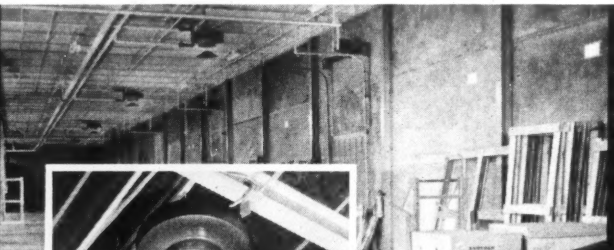
HERE, FOUR HERMAN NELSON HEATING AND VENTILATING UNITS assure ample space heat in the large warehouse at the Newton, Iowa, plant . . . one of several such "cluster" arrangements. Suspended from the ceiling, the units hang out of the way, save valuable space, provide quiet operation. Herman Nelson units of this type are available in heat capacities to one million BTU's.

Easy-to-service **HERMAN NELSON** equipment solves many heating, exhausting and ventilating problems at **MAYTAG'S** Iowa plants

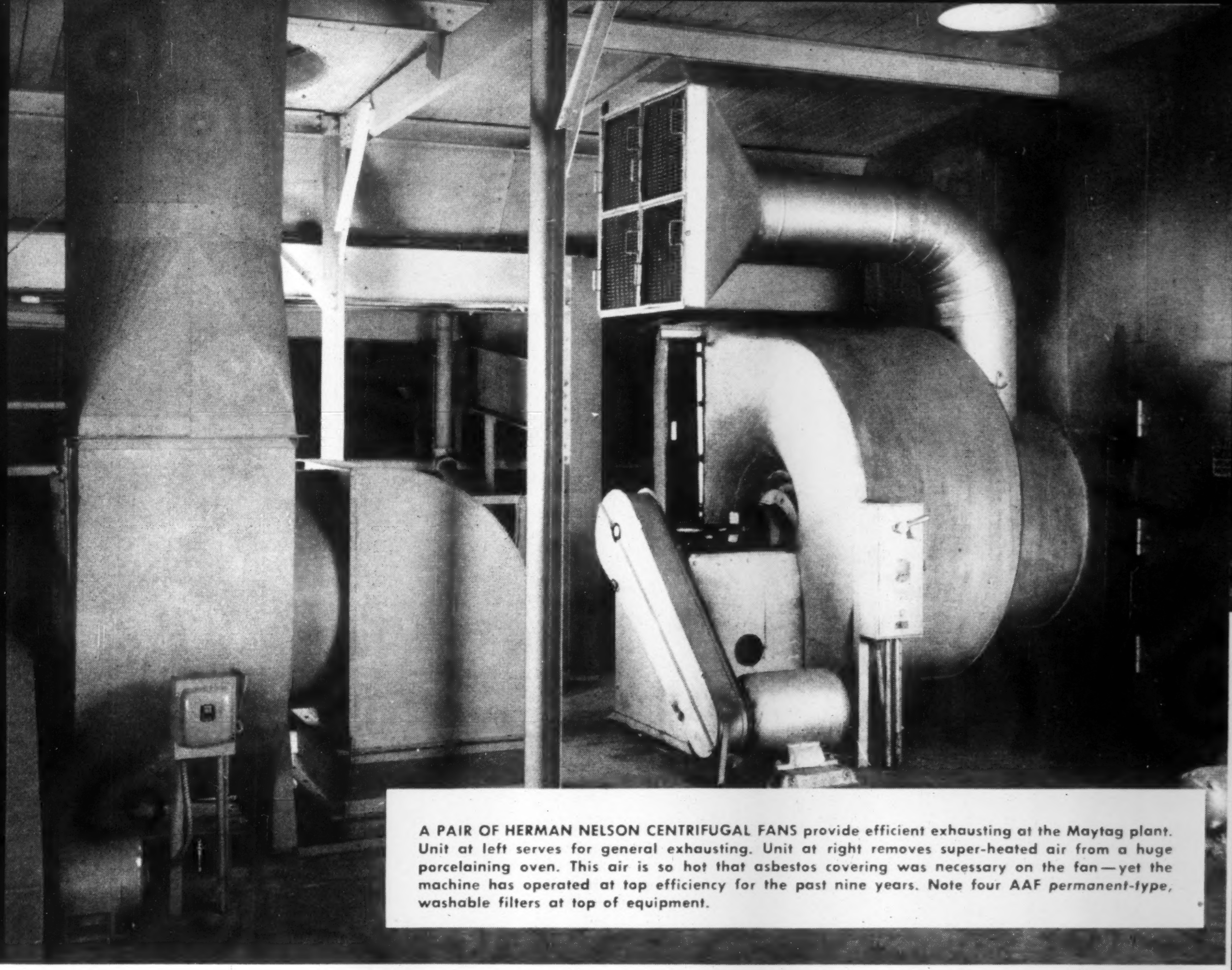
Architects & Engineers—Brooks-Borg, Des Moines; Mech. Contractor—M. A. Wolin Plumbing & Heating, Des Moines; Gen. Contractor—Weitz Co., Des Moines. Fans engineered and installed by R. C. Mahon Co., Detroit.



TWO OTHER HERMAN NELSON HEATING AND VENTILATING UNITS provide abundant space heat for a service repair area. Here, units are located out of the way on a balcony. They can be installed on wall, ceiling or floor—with or without ducts. Fan sections are completely rotatable.



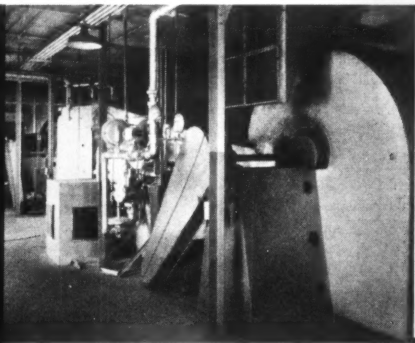
A BATTERY OF HERMAN NELSON VERTICAL UNIT HEATERS discharge warm air vertically downward or at an angle in various directions. Warehouse is heated comfortably, without drafts. Note location of the heaters high on the ceiling, out of the way. Insert shows Unit Heater detail.



A PAIR OF HERMAN NELSON CENTRIFUGAL FANS provide efficient exhausting at the Maytag plant. Unit at left serves for general exhausting. Unit at right removes super-heated air from a huge porcelaining oven. This air is so hot that asbestos covering was necessary on the fan—yet the machine has operated at top efficiency for the past nine years. Note four AAF *permanent-type*, washable filters at top of equipment.

Recently, Maytag's 10-millionth washer rolled off the production lines, as this independent home laundry appliance manufacturer set a production record unequaled in the industry. To reach this kind of record, Maytag plants must operate smoothly, efficiently. Dependable heating and ventilating is mighty important to help maintain these production schedules. Men *and* machines must operate efficiently, too.

Selection of Herman Nelson equipment for Maytag's automatic washer and dryer plant at Newton, Iowa, is another example of the confidence large manufacturers have in Herman Nelson. Years of trouble-free service are assured. If yours is a problem requiring better air, you can *depend upon* the quality, performance and efficiency of this *complete* line of air handling equipment. Tell us your needs. Our nation-wide sales and service organization is ready to help.



HERMAN NELSON CENTRIFUGAL FANS here handle other exhausting problems in the plant. These fans are available in either slow-speed or non-overloading types; 17 wheel diameters from 12¼" to 73"; 8 arrangements for direct or belt drive.

"Better Air Is Our Business!"

AAF

herman nelson

American Air Filter

Company, Inc.

215 Central Avenue • Louisville 8, Ky.

6 GOOD REASONS WHY

you should specify the NEW Acme FLOW-MIZER® COOLING TOWERS and EVAPORATIVE CONDENSERS

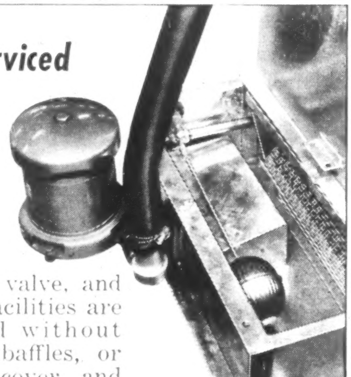
3 Twice as much surface protection

ELECTRO-PLATED
.002″
16 GAUGE STEEL
.002″
.004″ OF ZINC

HOT-DIP GALVANIZED
AFTER FABRICATION
.004″
16 GAUGE STEEL
.004″
.008″ OF ZINC

The diagram shows how Acme's hot-dip galvanizing deposits twice the thickness of zinc that ordinary electro-plating does. By dipping all assemblies *after* fabrication, no surface is left exposed. With twice the protection against rust and corrosion, Acme units provide unexcelled long life . . . never need painting.

4 Easily serviced external sump



On both cooling towers and evaps, Acme's external sump provides easy access. Sediment screen, float valve, and water treatment facilities are all quickly reached without removing panels, baffles, or screens. Just lift cover, and sump is open for easy servicing, cleaning, or draining.

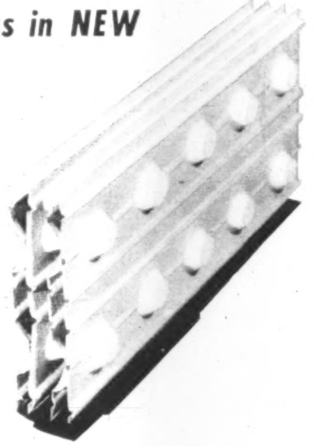
ACME AIR CONDITIONING REFRIGERATION

Acme INDUSTRIES INC., Jackson, Michigan

Manufacturers of Quality
Air Conditioning and
Refrigeration Equipment
since 1919

PACKAGED CHILLERS
PACKAGED HEAT PUMPS
EVAPORATIVE CONDENSERS and COOLING TOWERS
ROOM CONDITIONERS

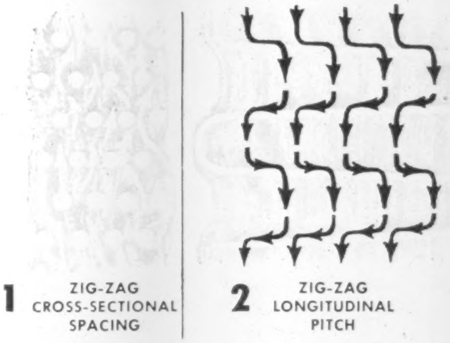
1 NEW Plastic Pak weighs 90% less in NEW FLOW-MIZER Cooling Towers!



The new all-plastic Acme-Pak offers further proof of Acme's progress in cooling tower design. Where a steel pak would weigh 2300 lbs. (as in the 100-ton tower), the Acme-Pak now weighs 180 lbs! This means less weight on roofs, easier installation, lower freight costs.

What's ~~more, this~~ remarkable new pak cannot rot like wood nor rust like metal. Water deposits cling less, are easily washed off. The new Acme-Pak cuts tower costs two ways: lower installed cost, lower maintenance cost.

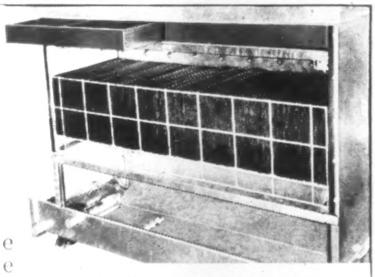
2 Zig-Zag Coil Spacing means Greater Capacity, Less HP in NEW FLOW-MIZER Evaps.


1 ZIG-ZAG CROSS-SECTIONAL SPACING
2 ZIG-ZAG LONGITUDINAL PITCH

Acme's zig-zag spacing improves coil efficiency in two ways. First by staggering the tubes cross-sectionally, both air and spray water are forced to travel a longer zig-zag path through the coil effecting greater turbulence and better heat transfer.

Secondly, Acme coils are pitched to form a continuous zig-zag slope longitudinally. This keeps the falling spray water in longer contact with the tubes, also allows the condensed refrigerant to drain more rapidly. The result is more efficient evaporation . . . which means greater capacity in less space with less blower horsepower required.

5 Full access to coils or pak

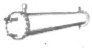


The new Acme Flow-Mizers are designed for full accessibility . . . fast, easy maintenance. In addition to sliding inspection doors, full-width panels are readily removed for convenient servicing of spray nozzles, eliminators, coil or pak. "File-drawer" pak and eliminators (see above) slide out for easy cleaning.

6 Balance where it counts

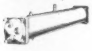
The complete blower assembly of an Acme cooling tower or evaporative condenser is electronically balanced *after* final assembly. Perfect balance is attained for quiet smooth-running operation under all conditions, less wear on blower shaft bearings, longer trouble-free service.

send coupon attached to your letterhead . . .


DRY-EX LIQUID CHILLERS

LIQUID RECEIVERS

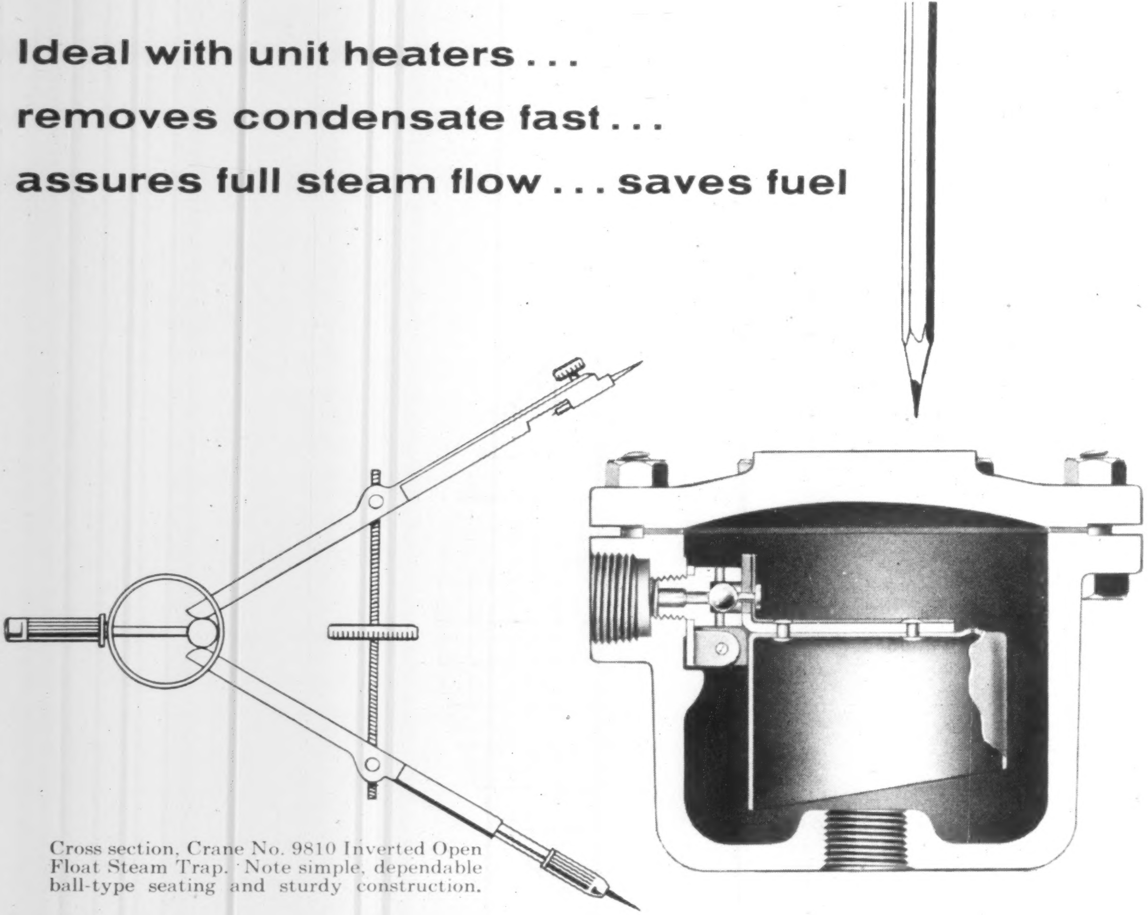
HEAT EXCHANGERS


CONDENSERS

OK: Send me details:

☐ **New Flow-Mizer Evaporator Condensers,** thru 200 tons
☐ **New Flow-Mizer Cooling Towers,** 20 thru 175 tons
☐ **New Flow-Cold Cooling Towers,** 3 thru 20 tons

Ideal with unit heaters . . .
removes condensate fast . . .
assures full steam flow . . . saves fuel



Cross section, Crane No. 9810 Inverted Open Float Steam Trap. Note simple, dependable ball-type seating and sturdy construction.

CRANE-designed steam traps

KEEP STEAM DRY, HOT, EFFICIENT

Wherever steam is used—for space or apparatus heating, or for operating machinery—installing Crane steam traps will insure maximum efficiency and economy.

By draining off condensate automatically as fast as it accumulates, they keep the steam dry, hot, and fast flowing. They save fuel . . . prevent water-logging of lines . . . stop water-hammer and the damage it can do.

Crane Inverted Open Float Steam Traps have only one moving part. They provide unusually high discharge capacity in relation to size. This permits more compact installation.

Available for working pressures from 1 to 300 pounds saturated steam, in sizes ½ to 1 inch.

For data on capacity requirements and installation procedures, consult your local Crane Representative, or write for new folder AD-2261.

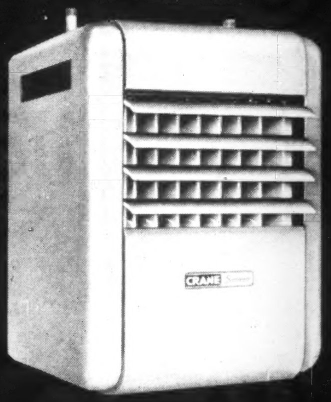
CRANE VALVES & FITTINGS

PIPE • PLUMBING • KITCHENS • HEATING • AIR CONDITIONING

Since 1855—Crane Co., General Offices: Chicago 5, Ill. Branches and Wholesalers Serving All Areas

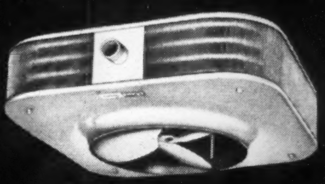
CRANE

Now! A complete line of Crane Sunnyaire Unit Heaters

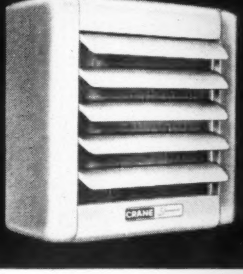


SUNNYAIRE GAS UNIT HEATER. 7 basic models provide 25,000 to 200,000 Btu/hr. capacities.

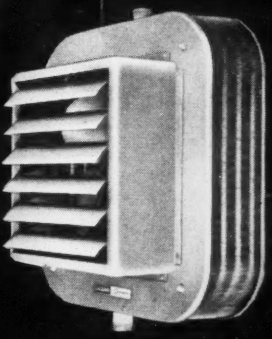
SUNNYAIRE HOT WATER AND STEAM UNIT HEATERS. 58 models provide 15,000 to 684,000 Btu/hr.



TYPE HV with wrap-around coils, vertical discharge.



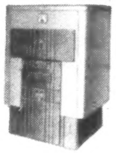
TYPE H with continuous-tube coils.



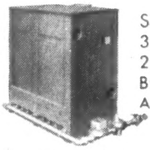
TYPE HV arranged for horizontal mounting.

CRANE SUNNYDAY BOILERS

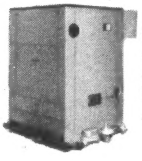
—perfect companion to Sunnyaire hot water and steam unit heaters



SUNNYDAY 30
268,000 to
1,367,000
Btu hr., gross
IBR output



SUNNYDAY 40
350,000 to
2,380,000
Btu/hr.,
AGA input



SUNNYDAY 60
625,000 to
5,000,000
Btu/hr.,
AGA input

Gas, hot water and steam models, full range of sizes

Now you can fill *every* industrial and commercial unit heater specification with the *quality* heater—Crane Sunnyaire.

Sunnyaire gas unit heaters are completely automatic, completely safe, and real penny pinchers with fuel. They're designed for natural, manufactured, mixed, or LP gases, and come equipped with standard controls for these fuels. Seven basic models provide 25,000 to 200,000 Btu per hour. All models are fully approved by the American Gas Association.

If the specifications call for hot water or steam, Sunnyaire provides 58 models with capacities from 15,000 to 684,000 Btu per hour. Type H units with continuous-tube coils and Type HV units with rectangular wrap-around coils work equally well with hot water or steam.

All models are quality built, easy to install and maintain. So look into the big sales possibilities of the new Crane Sunnyaire line now! Get full details from your Crane Branch or Crane Wholesaler. In plumbing, too, ask for Crane Quality.

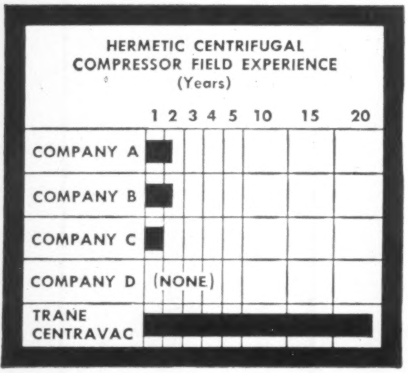
CRANE CO. 836 South Michigan Avenue, Chicago 5

VALVES • FITTINGS • PIPE • PLUMBING • KITCHENS • HEATING • AIR CONDITIONING

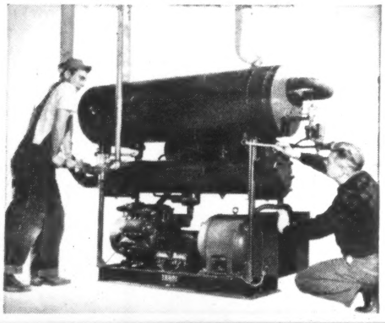
19 years of proven
behind every Trane

INSTALL IT ANYWHERE!

Basement to penthouse, the TRANE CenTraVac fits in anywhere. And you don't need heavy concrete supports or multi-level bases. Complete range of sizes from 45 to 800 tons; duplex models to 1,500 tons.



COLD GENERATORS. Package water chillers from 10 to 150 tons capacity. 4-step compressor modulation cuts power consumption. Complete factory pre-assembly includes automatic control panel.



field performance CenTraVac water chiller

For job-tested dependability, specify the industry's first hermetic centrifugal

There are *nineteen solid years* of practical field experience built into the TRANE CenTraVac water chiller for 1957! And this proven field performance is your best assurance of sound engineering . . . long years of trouble-free operation.

Since 1938—when the first TRANE centrifugal hermetic was installed—TRANE has refined . . . improved . . . perfected . . . tested these water chillers until now, for 1957, TRANE offers the most dependable units ever built!

Efficient capacity control! Separate control of *both* stages of compression assures minimum power consumption under *all* part load conditions. The TRANE CenTraVac water chiller automatically throttles down to 10% of capacity. Actual installations show many instances of capacity control down to 5%—and even lower!

Extensive published ratings! The TRANE CenTraVac for 1957 is based upon 19 years of continual laboratory testing of *complete machines*—certified in years of field performance. And TRANE offers you the most extensive published ratings and data available for machine selection. (The CenTraVac is flexible, too—may be installed with any type of pneumatic or electronic-pneumatic control system.)

Low noise level! The TRANE CenTraVac water chillers have been successfully installed next to conference rooms . . . libraries . . . executive offices. You can specify a CenTraVac with confidence that you are getting the *quietest* equipment of this type. This quiet operation is another indication of the advanced engineering built into the TRANE CenTraVac!

For your next refrigeration job, make it a TRANE CenTraVac—the industry's *first* hermetic centrifugal, *and the best!* For complete facts, call your nearby TRANE Sales Office, or write TRANE, La Crosse, Wisconsin.

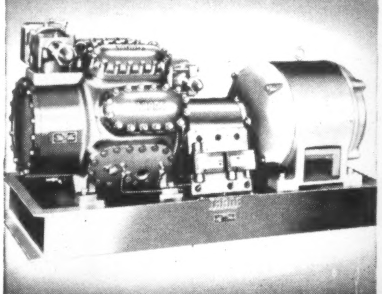
For any air condition, turn to

TRANE

MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

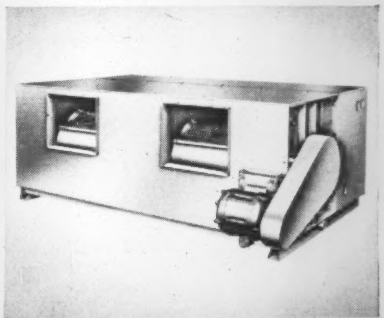
THE TRANE COMPANY, LA CROSSE, WIS. • EASTERN MFG. DIV., SCRANTON, PA. • TRANE COMPANY OF CANADA, LTD., TORONTO • 90 U.S. AND 19 CANADIAN OFFICES

RECIPROCATING COMPRESSOR. Dependable multi-step capacity control reduces starting and stopping. Exclusive cadmium-plated valves last up to 800% longer than steel! Capacities from 10 to 50 tons.



UNITRANE UNITS. Individual room air conditioners in Fan-Coil (illustrated) or Induction models provide for filtering all the air—not just primary air. Floor models, ceiling models and concealed units.

CLIMATE CHANGER. Solves air handling problems faster, easier. Factory *pre-assembled* units are sectionalized, more accessible. New fan assembly gives you a variety of discharge patterns. 600 to 29,000 cfm.



for high-efficiency air conditioning performance, specify

JOHNSON PNEUMATIC CONTROL

Preferred Insurance Company, Grand Rapids, Michigan. Skidmore, Owings & Merrill, architects and mechanical engineers, Chicago; Holwerda-Huizinga Co., mechanical contractor, Grand Rapids.

Ceramic tile mural above the sidewalk is heated by a radiant coil to keep the thousands of tiny tiles intact during freezing weather. A weather-compensated thermostat keeps the panel at a constant temperature.

No matter how you want to control your air conditioning, you can do it better with pneumatic control. You can provide any combination of operating features you need—central control panels, automatic sequencing, automatic compensation, remote temperature readings and all the others.

Pneumatic flexibility solves the most intricate problems as easily as the simplest. Pneumatic control can be applied to all types of air conditioning and to all makes of equipment. In short, it can meet the exact needs of *any* installation!

Pneumatic control offers other, equally important, advantages. It's far simpler than anything else you can use. It has far fewer components. It has fewer parts subject to failure. It's easier to operate and much easier and less costly to maintain. It functions accurately and reliably with a minimum of supervision—there's nothing to require constant checking and adjustment.

These and other advantages are bringing greater comfort, smoother air conditioning performance and long range operating economies to countless new buildings. The system in the impressive new Preferred Insurance Company Building, shown here, is a good example of what pneumatic control can do for you, too.

Whether your plans involve new construction or a modernizing program, let Johnson, the leader in pneumatic control, give you the full story as it applies to your problems. A nearby Johnson engineer will gladly call at your convenience. Johnson Service Company, Milwaukee 1, Wisconsin. Direct Branch Offices in Principal Cities.

JOHNSON CONTROL

SINCE 1885

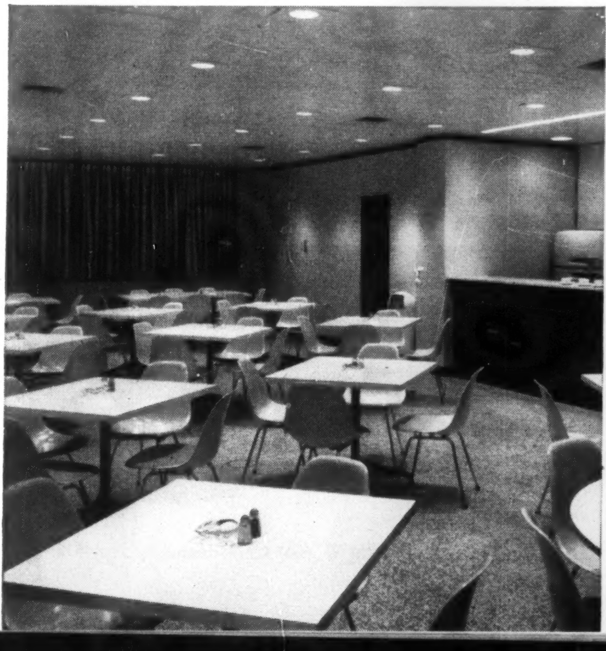
PLANNING • MANUFACTURING • INSTALLING

Perimeter offices are heated and cooled by under-window units that offset heat loss or gain from floor to ceiling glass areas. Units are individually controlled by Johnson Thermostats that apply the final heating or cooling effect to the pre-conditioned primary air supply.

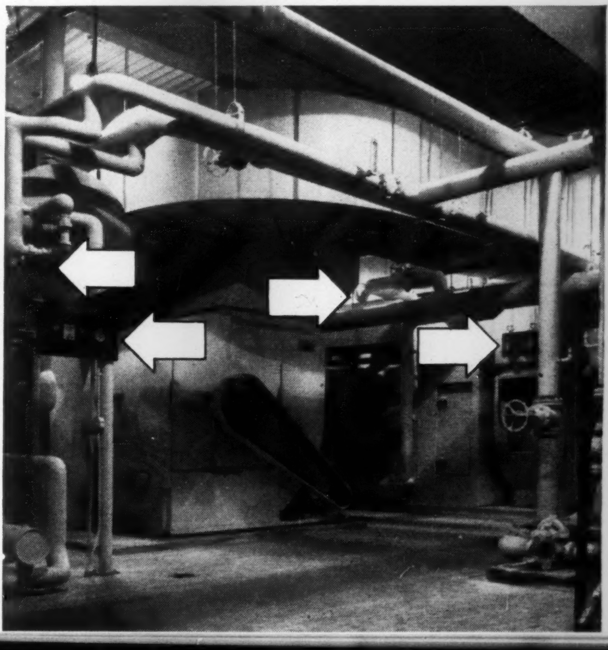
Two large central fan systems supply either cooled or tempered primary air to other sections of the building. Perfectly conditioned air is discharged into each of 29 zones, as directed by strategically located Room Thermostats controlling reheat coils in the system.

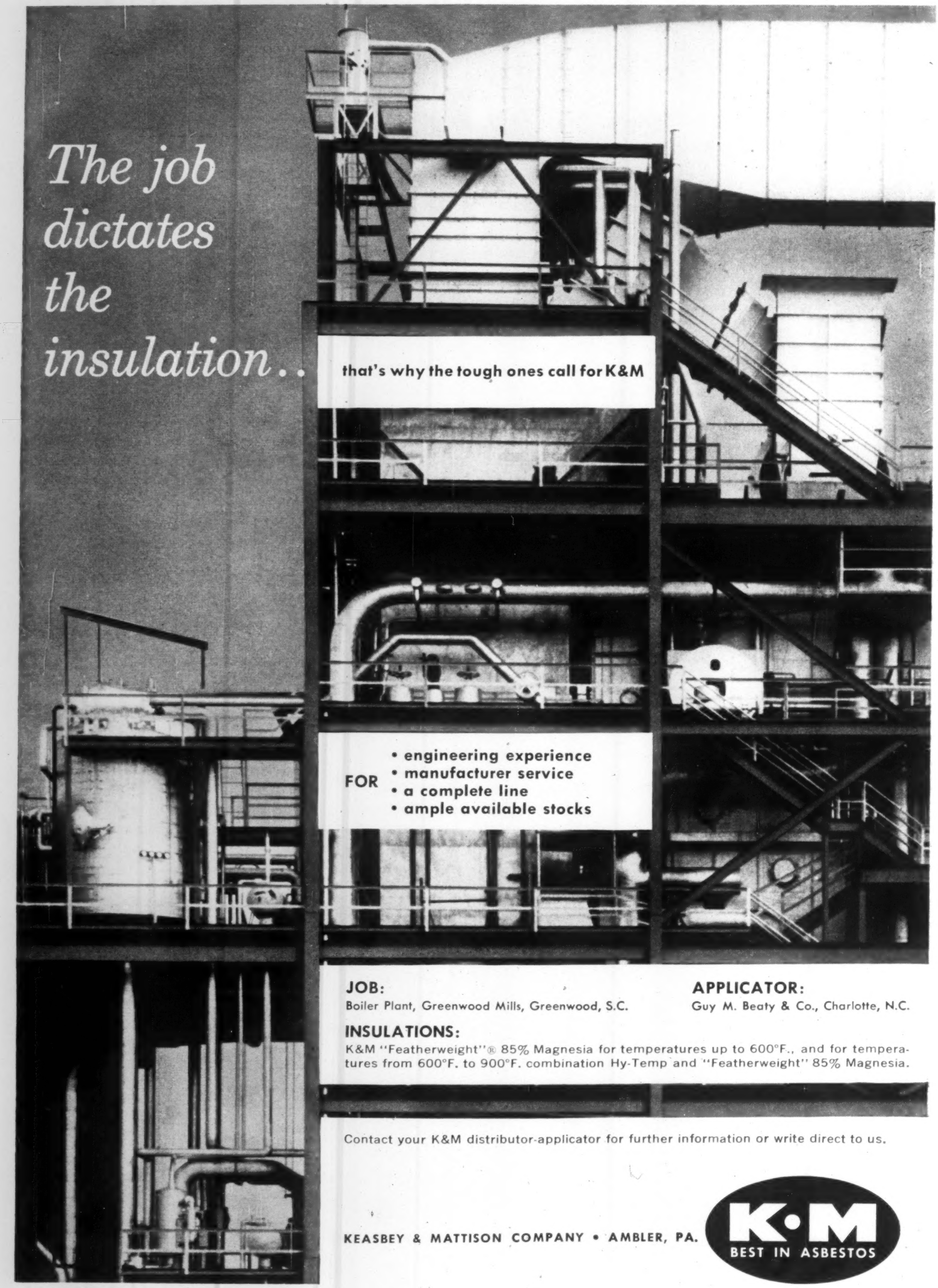
Only a *Pneumatic* System Can Satisfy Modern Control Requirements So Completely and Efficiently, Yet So Simply and Economically

Empty, full or only partially occupied, the dining room is always comfortable. Here, Johnson Thermostats easily compensate for changing occupancy levels. Throughout the building all air conditioning equipment, the refrigeration compressor, the main and domestic hot water converters, the fan coil converter, convectors and exhaust fans are controlled by Johnson pneumatic equipment.



Typical Johnson equipment is shown controlling the central fan units. With pneumatic control, high-efficiency air conditioning performance is accomplished with simpler and fewer components than would otherwise be needed. Inexpensive air control gauges, exclusive with pneumatic systems, provide a system-wide check on performance, adding greatly to operating convenience and efficiency.





The job dictates the insulation..

that's why the tough ones call for K&M

FOR
- **engineering experience**
- **manufacturer service**
- **a complete line**
- **ample available stocks**

JOB:
Boiler Plant, Greenwood Mills, Greenwood, S.C.

APPLICATOR:
Guy M. Beaty & Co., Charlotte, N.C.

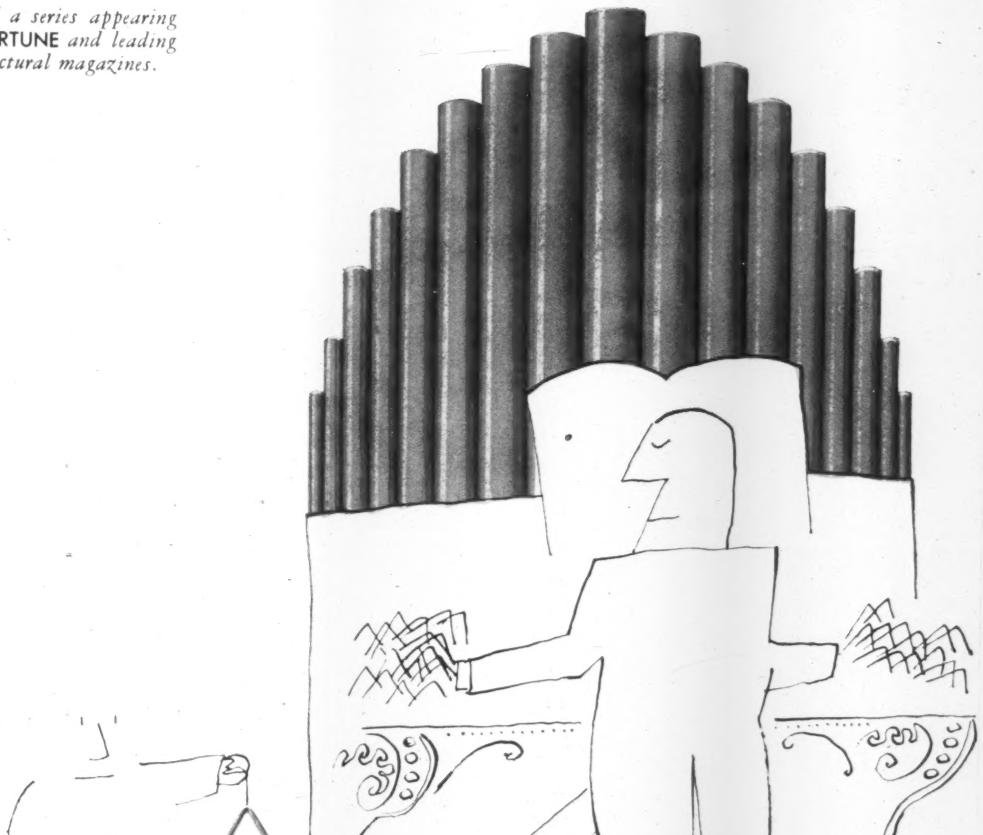
INSULATIONS:
K&M "Featherweight"® 85% Magnesia for temperatures up to 600°F., and for temperatures from 600°F. to 900°F. combination Hy-Temp and "Featherweight" 85% Magnesia.

Contact your K&M distributor-applicator for further information or write direct to us.

KEASBEY & MATTISON COMPANY • AMBLER, PA.

K•M
BEST IN ASBESTOS

One of a series appearing in **FORTUNE** *and leading architectural magazines.*



Lewin-Mathes' quality strikes a responsive accord.

high fidelity

Despite the large number of new customers for Lewin-Mathes Copper and Brass tube, pipe and rod in recent years, better than 90 per cent of our business comes from *repeat* customers. High fidelity of a rare order!

So long as we remain faithful to the highest standards of tolerance, temper and uniformity, we can expect our customers to remain loyal to Lewin-Mathes products. And as specialists—with a *completely integrated* plant designed specifically for the manufacture of tube, pipe and rod—it's in our own best interest to be *perfectionists*.

For the most fitting accompaniment to your plumbing, heating and air conditioning installations, specify...

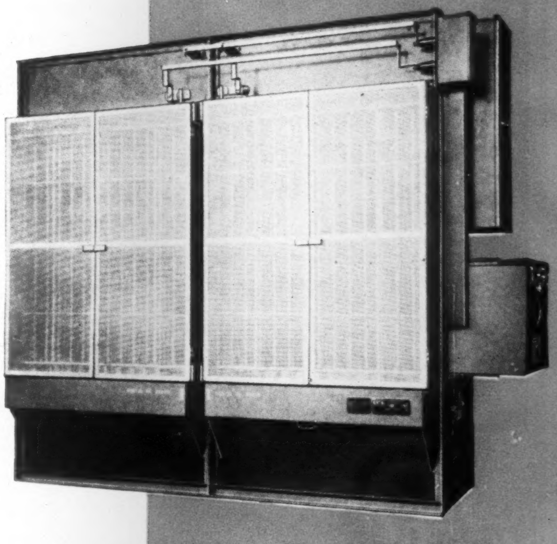
LEWIN MATHES
SAINT LOUIS, MISSOURI
MANUFACTURERS OF
COPPER AND BRASS TUBE, PIPE AND ROD

Office Building

THE NEW ENGLAND LIFE BUILDING, Boston, Massachusetts. Architects: Cram & Ferguson; Engineers: Buerkel & Company. ELECTRO-MATIC filters supply 200,000 cfm of super-clean air on nine air conditioning systems.

Saves $16,000 a Year with Electro-MATIC filters!

New England Life Building gets SUPER-CLEAN Air at a saving



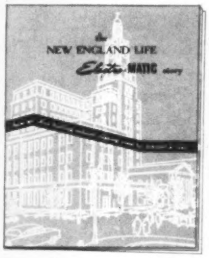
THE MODEL F ELECTRO-MATIC eliminates the most minute dust particles—even smoke! No time out for washing down with water, no need for extra sewer or water connections. Not even *buttons* to *push!* ELECTRO-MATIC maintains its efficiency through continuous self-cleaning.

IN 1941, when the New England Life Insurance Company moved into its beautiful new building, *mechanical* filters were installed to supply 200,000 cfm of clean air for nine air conditioning systems.

Six years later, these filters were replaced with AAF ELECTRO-MATICS. Results: *super-clean* air allowed a *20% reduction* in the cleaning staff. The ELECTRO-MATICS have long since paid for themselves and are now saving the Company $16,000 *every year* they are in operation!

And maintenance is remarkably simple. One man spends *less than 8 hours a week* maintaining filters on all nine systems. That's because ELECTRO-MATIC has its own built-in "maintenance crew"—cleans *itself* continually, *while it's cleaning the air!*

Super-clean air at a saving—that's "the New England Life ELECTRO-MATIC Story" in a nutshell. *Now*—get the *whole* story. Write for free 12-page booklet that provides complete data on ELECTRO-MATIC's money-saving performance.

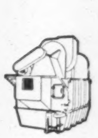


AAF

American Air Filter
COMPANY, INC.

herman nelson

373 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P.Q.



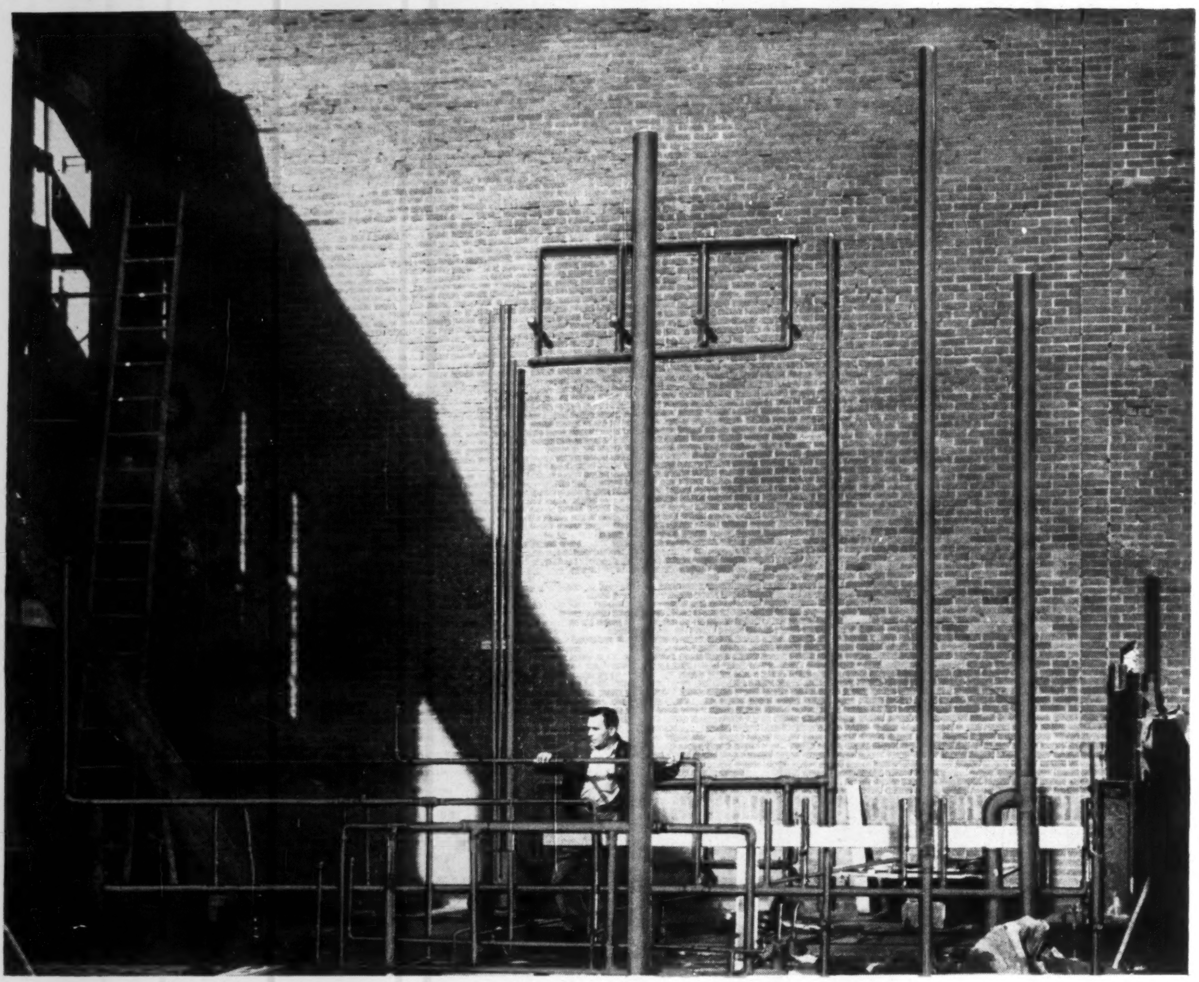
AAF Dust Control Equipment

Illinois Steam Heating Specialties

BETTER AIR IS OUR BUSINESS

Herman Nelson Unit Heaters

Herman Nelson Unit Ventilators



In this addition to a school building, the plumbing contractor took advantage of the light weight and long lengths of copper tube to complete much of his roughing-in well ahead of other construction.

Only Copper gives you money-saving short cuts like this

YOU have more control of time and installation costs when you use copper tube in plumbing.

Other construction doesn't tie you down. The long lengths and light weight of copper tube enable you to work ahead of other building construction — as in the job shown above — to complete much of the roughing-in when it's most convenient for you.

You can save man-hours — utilize time that otherwise might be wasted in waiting around — by prefabricating sections, at the shop or on the job site. Just the ease of using solder-joint fittings makes installation simpler and faster. Contractors report that installation time has been reduced one-third to one-half.

Anaconda Copper Tubes are available in all standard wall thicknesses — Types K, L, M, and the new lighter weight Type DWV Copper Drainage Tube. And Anaconda wrought and cast solder-joint fittings are available in a wide range of sizes and types.

Write for descriptive literature on ALL-COPPER plumbing. Address: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario. 5702

ANACONDA®

COPPER TUBE AND FITTINGS

Available through Plumbing Wholesalers

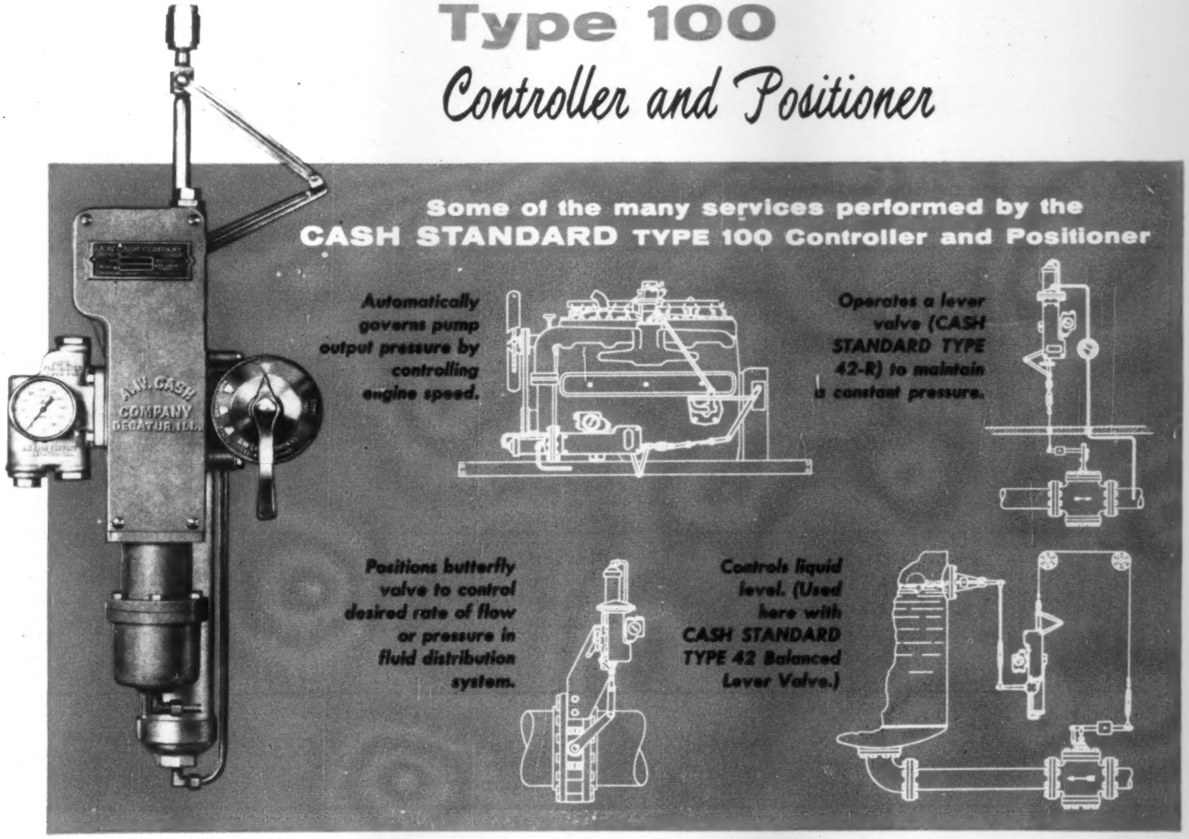
automatic control or positioning problem?

Here's the answer . . . the versatile

CASH STANDARD

Type 100

Controller and Positioner



Some of the many services performed by the CASH STANDARD TYPE 100 Controller and Positioner

Automatically governs pump output pressure by controlling engine speed.

Operates a lever valve (CASH STANDARD TYPE 42-R) to maintain a constant pressure.

Positions butterfly valve to control desired rate of flow or pressure in fluid distribution system.

Controls liquid level. (Used here with CASH STANDARD TYPE 42 Balanced Lever Valve.)

include this unit in your process system as:

1. A controller with self-contained positioning mechanism.
2. A power positioner actuated by a signal from another controller.

The Type 100 coupled with various types of final control elements will accurately control:

• Pressure • Liquid level • Rate of flow • Other process variables

The Type 100 features: • Feed back type control • Adjustable range • High sensitivity • Linear or curved line characteristics • Reverse or direct action • Optional manual control • Double acting cylinders, 6″ or 12″ stroke, 2″, 2¾″ or 4″ bore for operating pressures up to 125 psi. (Also suitable for larger cylinders in combination with volume booster when higher thrusts are desired.) • Operation by air, oil or clean water.

Available for these signal ranges: • Vacuum • Differential pressure • Pressures up to 600 psig. • Lever motion

WRITE TODAY for complete information, including literature, on this versatile instrument. Dept. B

CASH STANDARD

A. W. CASH COMPANY, P. O. Box 551, Decatur, Illinois

Pressure, Hydraulic, Temperature, Process and Combustion Controls

See your wholesaler for

genetron® super-dry REFRIGERANTS

a complete line for your every need!

genetron 11—ORANGE LABEL TRICHLOROMONOFLUOROMETHANE	For industrial and commercial refrigeration and air conditioning systems using single or multi-stage centrifugal compressors. Can also be used for either direct or indirect expansion-type systems.
genetron 12—WHITE LABEL DICHLORODIFLUOROMETHANE	Used in virtually all types of refrigeration and air conditioning equipment, large and small, household and industrial, direct and indirect expansion systems. Typical units in which "Genetron" 12 and 22 are used: refrigerators, freezers, frozen food lockers, window air conditioners, home or office console units, large custom-built units for commercial comfort or industrial processes, large store units, mobile units for transportation equipment, large home units for addition to present hot air heating systems.
genetron 22—GREEN LABEL MONOCHLORODIFLUOROMETHANE	
genetron 113—PURPLE LABEL TRICHLOROTRIFLUOROETHANE	Used in 50-ton and larger centrifugal compressors, primarily for large comfort cooling systems, brine cooling systems, and other commercial and industrial air conditioning and refrigeration systems.
genetron 114A—BLUE LABEL DICHLOROTETRAFLUOROETHANE	Used in centrifugal and rotary compressors for commercial, industrial and household refrigeration.

QUICK FACTS on genetron super-dry refrigerants

- Guaranteed exceptionally low moisture content
- Non-corrosive to standard equipment materials
- Non-toxic, non-flammable, stable, safe
- Critical and freezing points well outside range of operating uses
- Solvent action on oil helps prevent solidification or congealing of lubricant
- Freely interchangeable and may be mixed in any proportions with comparable fluorinated hydrocarbons meeting the same strict refrigerant specifications
- Aid in lubrication of equipment; generally miscible with oil
- Available everywhere, from refrigeration wholesalers throughout the country

GC

Allied Chemical

genetron department

GENERAL CHEMICAL DIVISION

ALLIED CHEMICAL & DYE CORPORATION

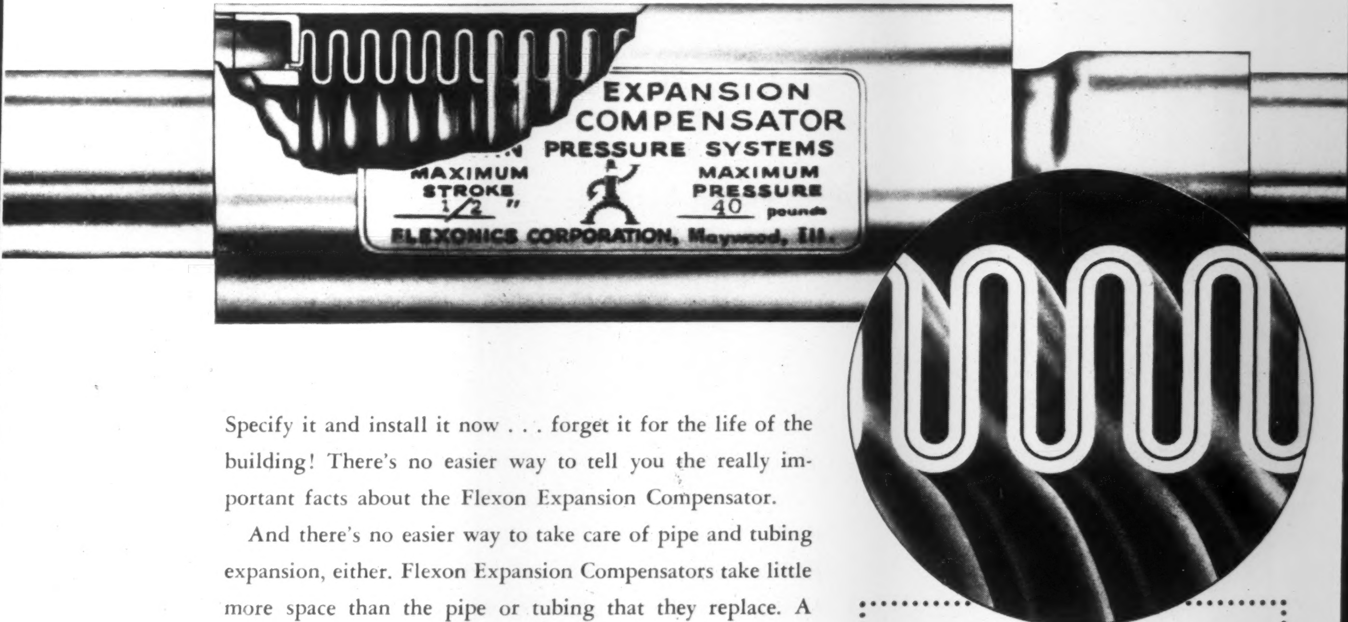
40 Rector Street, New York 6, N. Y.

INSTALL IT...FORGET IT!

Flexon®

PACKLESS EXPANSION COMPENSATOR

the no-maintenance way to take up expansion in heating lines


EXPANSION
COMPENSATOR
PRESSURE SYSTEMS
MAXIMUM STROKE 1/2"
MAXIMUM PRESSURE 40 pounds
FLEXONICS CORPORATION, Maywood, Ill.

Specify it and install it now . . . forget it for the life of the building! There's no easier way to tell you the really important facts about the Flexon Expansion Compensator.

And there's no easier way to take care of pipe and tubing expansion, either. Flexon Expansion Compensators take little more space than the pipe or tubing that they replace. A mechanic can install one in minutes. Thousands of installations have proved them.

Standardize on this simple specification: Flexon Expansion Compensators for horizontal and vertical lines — Model L for low pressures — Model H for higher pressures. Write today for design and cost data.

The inside story

2-PLY

CONSTRUCTION

The bellows is fabricated from two plies of specially-rolled metal to combine strength with flexibility. Bronze bellows for Model L; stainless steel for Model H.

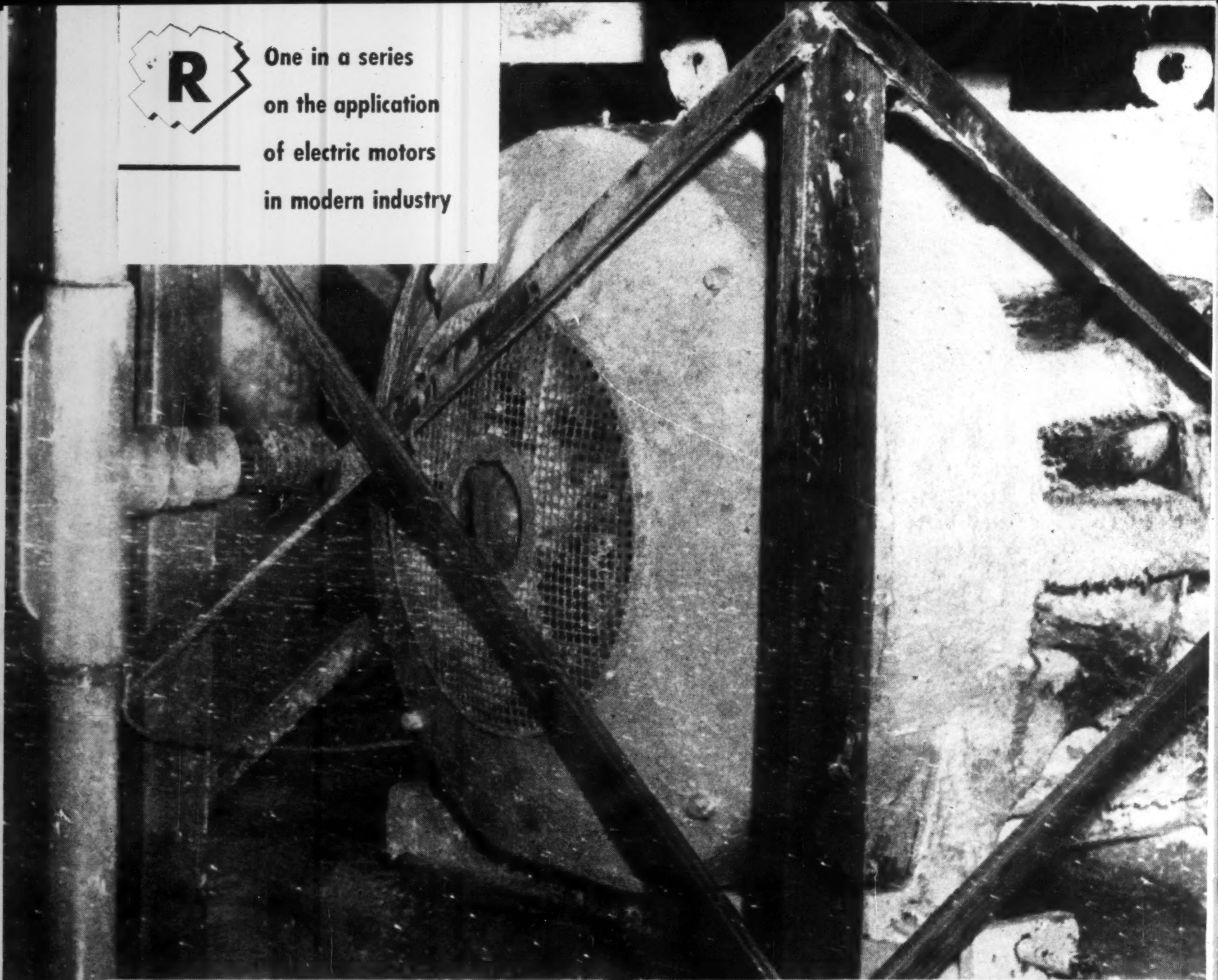
Flexonics®

corporation

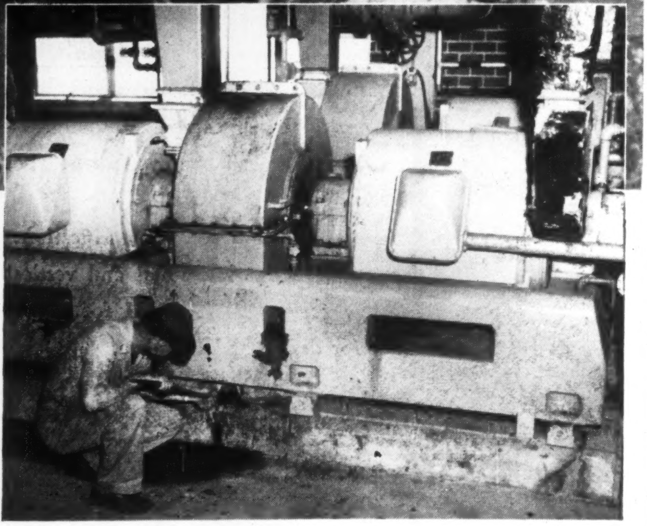
EXPANSION JOINT DIVISION • 1391 S. THIRD AVENUE, MAYWOOD, ILLINOIS

EXPANSION JOINTS · METAL HOSE · NON-METALLIC HOSE · BELLOWS · AIRCRAFT COMPONENTS

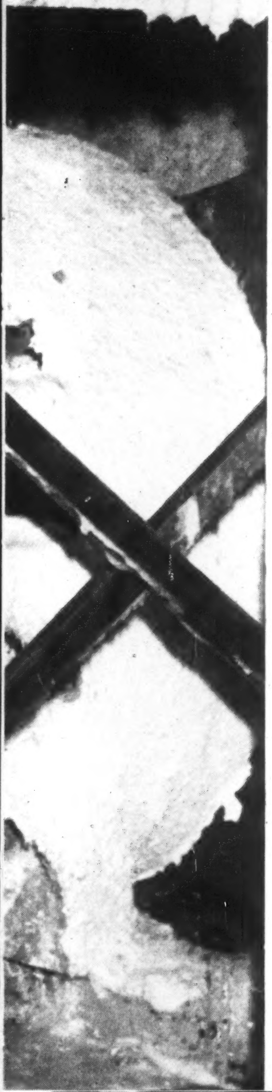
One in a series
on the application
of electric motors
in modern industry



This washer removes fly ash from cars left in the parking lot. The 25 hp. Reliance A-c. Motor automatically starts and stops 200 to 400 times a day in all kinds of weather.



These two Bauer Refiners are driven by Reliance 400 hp. A-c. Motors. The grinding action of the machines sets up heavy load factors on the motors.



RELIANCE motor design proved in new paper mill

Here is a 100 hp. Reliance Totally-Protected A-c. Motor doing a job under very adverse conditions. The water and pulp being sprayed on it is coming from a paper board machine, part of an installation that Crossett Paper Company recently built to produce bleached kraft board from hardwood and pine pulp.

But there is more to a Reliance Motor than just a good enclosure. Extra copper and iron, the best bearing lubrication system, tough, resistant insulation . . . these and many more features add up to designed durability, the one big feature that makes users, like Crossett, steady Reliance customers.

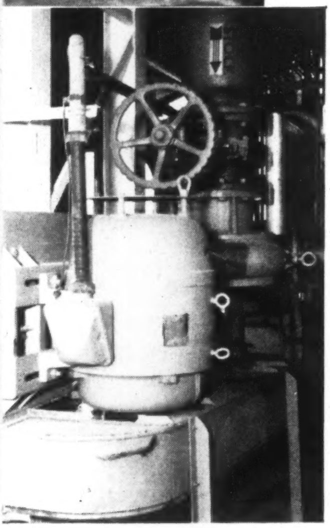
Call your Reliance representative and ask him to show you the Reliance extras. Fifteen minutes of your time now can save hours of machine downtime later.

For further details on this installation, write for bulletin B-2504. B-1535

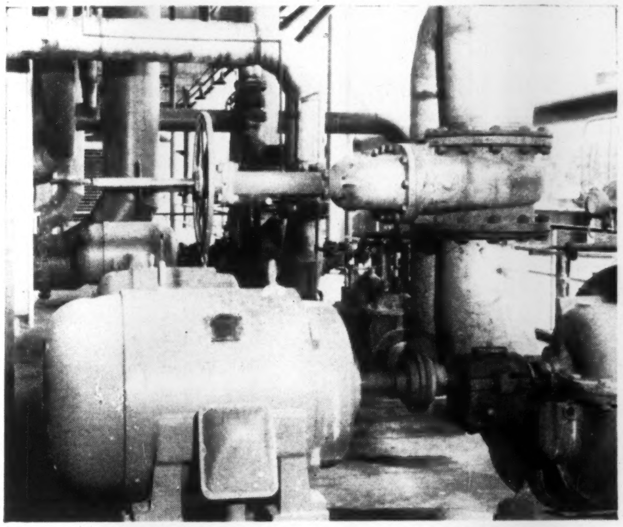
RELIANCE ELECTRIC AND ENGINEERING CO.

Dept. 364A, Cleveland 17, Ohio • Canadian Division, Welland, Ontario
Sales Offices and Distributors in Principal Cities

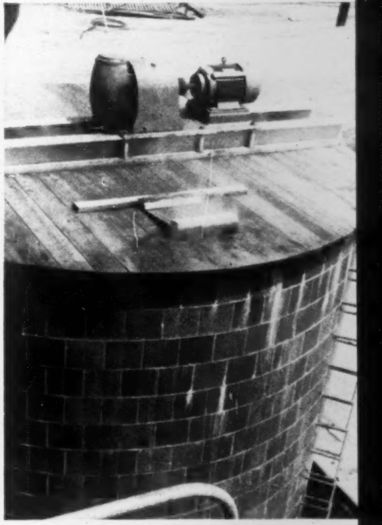
◀ Located under the head end of the board machine, this 100 hp. Reliance A-c. Motor operates a fan pump while periodically being drenched with water and pulp.



Reliance has frame designs for every application. Here is a 25 hp. foot mounted vertical motor driving a refined-stock pump. Other vertical designs include C-Face, D-Flange, and P-Base mountings.



This 60 hp., 1800 rpm and two 40 hp. 900 rpm Reliance A-c. Motors run white water pumps. Though reasonably sheltered from the elements, the motors are subjected to wide temperature changes.



In hard to reach spots like this two story high refined stock chest, Metermatic Bearing lubrication is very important. This new line 20 hp. Reliance A-c. Motor will operate the agitator for months without greasing.

Actual Photo of Econo-Pak and Budget-Blower Assemblies in Our Dayton, Ohio, Warehouse.

SERVING YOU FROM A "FULL WAGON"

Prompt Delivery From Full Stock Saves You Time and Money

LAU

Your need for rigid inventory control, geared to production, is helped immensely by Lau Econo-Pak.

Our big warehouse stock permits you to order blower assemblies *as you need them* . . . in the quantities you want, for the production that you estimate.

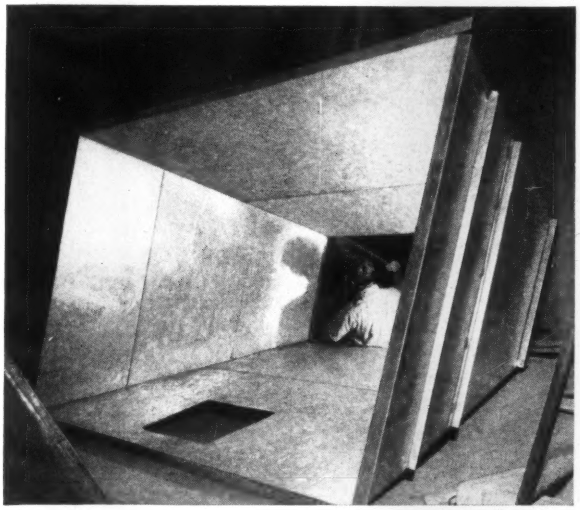
Specify Econo-Pak and release your inventory investment to work for you in some other part of your business. Save your warehouse space, reduce your inventory costs, make available your supplies for quick delivery to your customers.

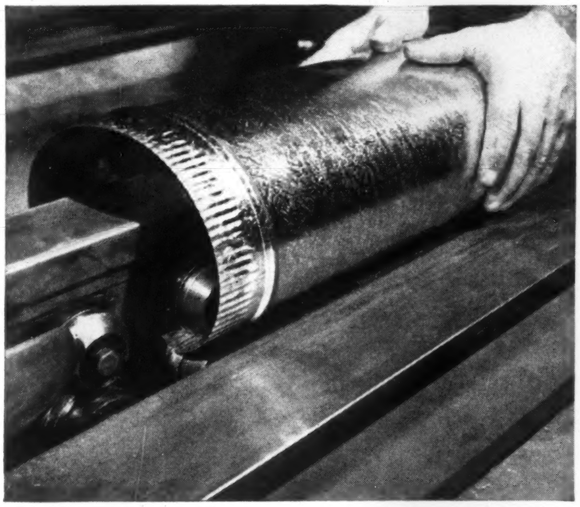
Versatile Econo-Pak provides all standard features of famous Lau Series "A" assemblies in a unit adaptable to many needs. *Now* Econo-Pak is also packaged in a pallet of 24, with bulk packaging of hardware, to give you new economy and simplicity of assembly. *Since Econo-Pak enjoys a rapid turnover, Preslok Wheel too, will be incorporated in all units as quickly as dies and tools are ready.*

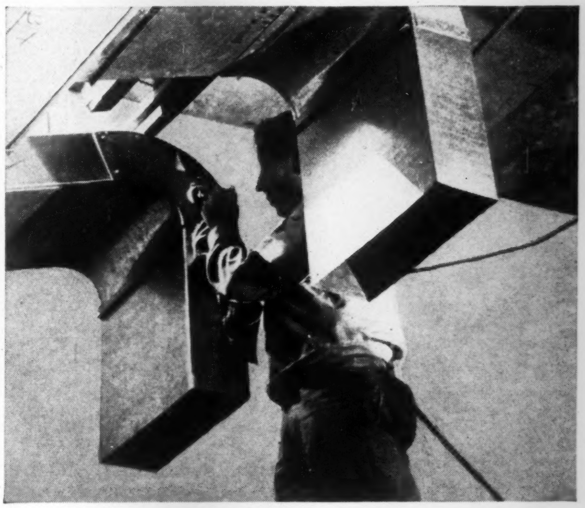
Yes! When you specify Econo-Pak, you see, you receive so many benefits . . . you save in so many ways. Why don't you have the Lau representative give you *all* the details on Econo-Pak.

World's Largest Manufacturer of Air-Conditioning Blowers

THE LAU BLOWER COMPANY
2027 Home Avenue, Dayton 7, Ohio
INDOOR COMFORT
Azusa, California. In Canada: The Lau Blower Company of Canada, Ltd., Kitchener, Ontario







Bethcon takes severe forming without flaking or cracking

Put a sheet of Bethcon through the toughest operations in your shop, then cast a critical eye over the galvanized finish. Any cracking, peeling, flaking?

Not on a Bethcon sheet! That's because in Bethlehem's continuous galvanizing lines the zinc is bonded much more tightly to the base metal than in the conventional hot-dip method. Thus, even when the sheet is doubled back on itself, the coating remains as sound as ever.

Bethlehem's continuous galvanizing process also imparts another advantage to Bethcon. It produces a sheet that is just soft enough for easy working, yet rigid enough to provide the strength you need in the finished product. Nowhere is this combination of qualities more important than in the fabrication of ductwork.

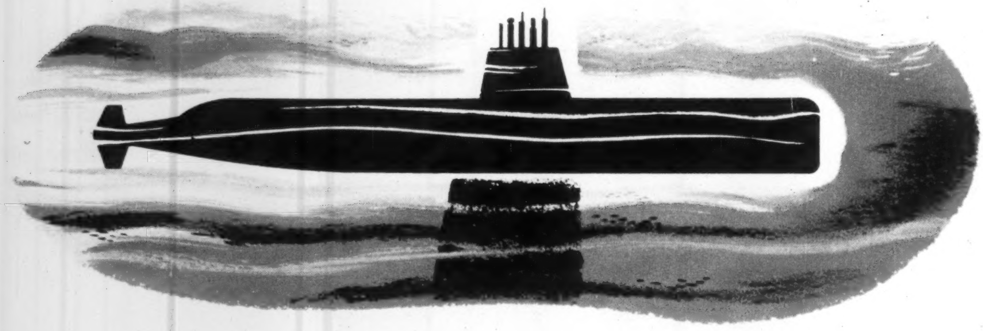
You can specify Bethcon in cut lengths or coils, 13-gage or lighter. You can also choose between carbon steel and corrosion-resisting Beth-Cu-Loy (copper bearing steel) for the base metal. For additional information about Bethcon sheets just get in touch with the nearest Bethlehem office.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL



How they solved a No. 1 problem of our Atomic Subs . . . FRESH AIR

Take a hundred men, hermetically seal them in a huge steel tube, then submerge the tube for days at a time.

Even without other contamination, just breathing would soon make the air within the tube unbearable. Then add body odors, a kitchen, a lot of complex machinery, areas where smoking is permitted, lavatories and waste tanks.

Call the result the "Nautilus" or the "Seawolf" and you have an idea of the problem of building submarines to utilize the power potential of nuclear energy. They can literally stay submerged as long as the crews can stand the confinement.

The scarcest commodity aboard our atomic subs is not fisionable material — it's plain old fresh air.

To solve the problem, the Navy turned to one of the oldest and most effective methods of air purification — adsorption by Activated Charcoal.

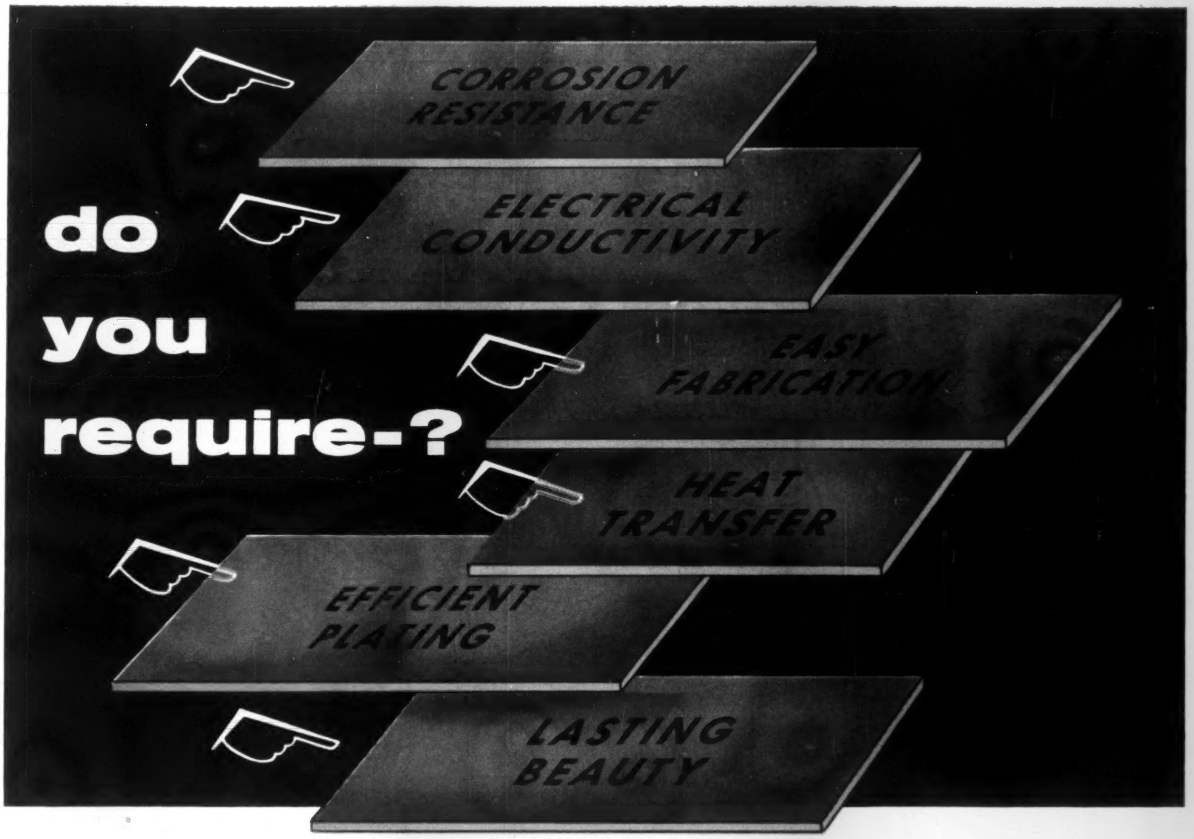
Barnebey-Cheney Activated Charcoal filters are a standard part of the subs' air conditioning systems. Others are installed on the waste tank vents, still others in the lavatories. Odors and contaminants are trapped and held in the Barnebey-Cheney Activated Charcoal.

The same principle can be applied to heating, ventilating and cooling of homes, offices, schools, hospitals or public buildings where fresh, healthful, odor-free air is essential. Barnebey-Cheney builds a complete line of air purifiers for applications of any size, from disposable filters for Amana and Philco window coolers to central system purifiers for the huge new Dallas Auditorium.

As in the atomic submarines, *true* air conditioning *must* include *air purification*. Activated Charcoal is the proven, practical means of accomplishing it. To learn more, write today for our free Technical Bulletin H 457.

BARNEBEY-CHENEY

CASSADY AT EIGHTH, COLUMBUS 19, OHIO • LOS ANGELES • SAN ANTONIO • ST. JOHNS, QUEBEC



do you require-?
CORROSION RESISTANCE
ELECTRICAL CONDUCTIVITY
EASY FABRICATION
HEAT TRANSFER
EFFICIENT PLATING
LASTING BEAUTY

HUSSEY COPPER

is your answer

Nothing else serves so well and with the same versatility as Copper . . . and there is no finer quality than HUSSEY COPPER. Complete control of quality from the mine to the finished rolled form gives Hussey Copper a distinctive uniformity and top quality that ideally suits it to all your copper requirements.

Copper in all its forms and grades can be obtained from Hussey in mill runs or warehouse quantities. When you think of copper . . . think of HUSSEY COPPER.

HUSSEY COPPER PRODUCTS

SHEET, ROLL AND STRIP . . .
ROD, WIRE AND SHAPES . . .
TUBING AND PIPE . . .
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C. G. HUSSEY & COMPANY
(DIVISION OF COPPER RANGE COMPANY)
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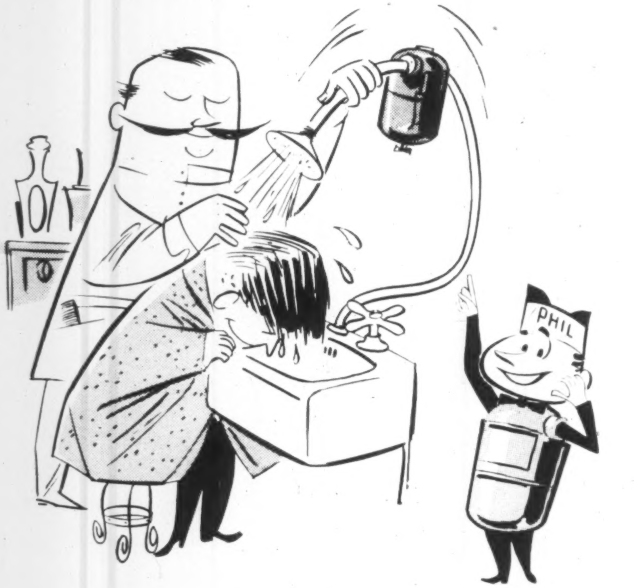
CHICAGO (18) 3900 N. Elston Ave. **ST. LOUIS (1)** Central Terminal Bldg. **PHILADELPHIA (30)** 1632 Fairmount Ave.
NEW YORK, LONG ISLAND CITY (6) 34-39 Thirty-first St.

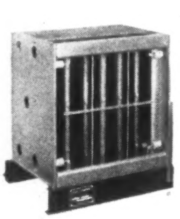
KEEP IT CLEAN... by Phil Tration



Here's a sales idea for you barbers. What customer could resist the appeal of a shampoo that's so clean even the rinse water is filtered by a Dollinger Staynew Filter? (What ridiculous application will they think of next).

This is just our way of showing you that the uses for Dollinger Filters are truly unlimited. Any liquid, gas or air can be efficiently and economically handled by them. Whether you want to protect machines or processes from damage caused by dust, dirt, oil, grease, or other foreign matter, there is a Dollinger Staynew Filter which will do the job efficiently and economically.

They are in use throughout the world... the recognized standard of quality wherever filters are used.



ELECTRO-STAYNEW PRECIPITATOR

Staynew Ventilating Filters—Among the complete line offered by Dollinger you will find one that meets your needs exactly. All types—Viscous Panel, Dry Panel, Electro-Static Precipitators and Automatic Filters. Illustrated is the Electro-Staynew Precipitator which removes 90% of all air-borne dirt, smoke, dust, pollen and oil mist. It's completely self-contained . . . Ionizer and Collector in one unit. 1200 to 1800 CFM. Larger capacities in multiple units. Ask for Bulletin 400. Dollinger Corporation, 9 Centre Park, Rochester 3, N. Y.

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STAYNEW **DOLLINGER**

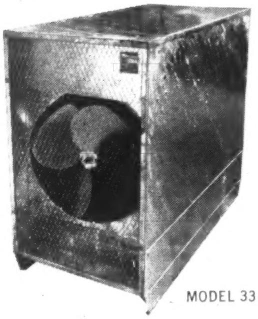
FILTERS

LIQUID FILTERS • PIPE LINE FILTERS • INTAKE FILTERS • HYDRAULIC FILTERS • ELECTROSTATIC FILTERS • MIST COLLECTORS • DRY PANEL FILTERS • SPECIAL DESIGN FILTERS • VISCOUS PANEL FILTERS • LOW PRESSURE FILTERS HIGH PRESSURE FILTERS • AUTOMATIC VENTILATION FILTERS • NATURAL GAS FILTERS • SILENCER FILTERS

Havens

COMPLETE LINE OF PERFORMANCE PROVED COOLING TOWERS FOR EVERY TYPE INSTALLATION

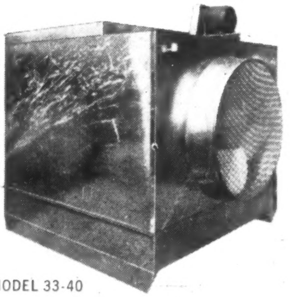
HOT DIPPED GALVANIZED After Fabrication



MODEL 33-7.5

RESIDENTIAL and SMALL COMMERCIAL INSTALLATIONS
3-15 TON

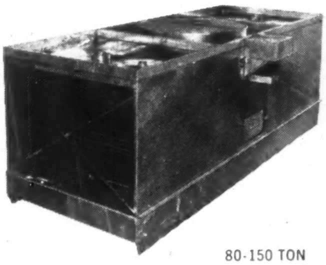
Small and compact, this tower has pan cover, expanded metal inlet screen and expanded metal fan screen. The motor and fan are recessed and hot water enters rear of distribution pan. Slow speed fans insure quiet operation. Easily disassembled if necessary.



MODEL 33-40

LARGE COMMERCIAL AND INDUSTRIAL INSTALLATIONS
20-60 TON

Constructed for easy disassembly, this tower has as standard features a fan screen, belt guard and weather-protected motors. Accessory items at a slight extra cost include a pan cover, expanded metal inlet screen and motor cover.

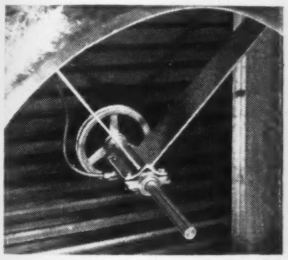


80-150 TON

HEAVY DUTY INDUSTRIAL INSTALLATION HAVENS VERTI FLOW
80-150 TON

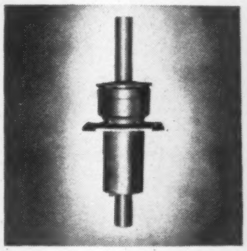
As modern as today's architecture, the low, sleek lines of the Havens Verti Flow Towers blend with building outlines. Fans are all aluminum – variable pitch – and sheaves are corrosion resistant cast iron. Shipped assembled. Also available – 175 and 200 ton Verti Flow models – shipped in 3 sections.

OUTSTANDING PERFORMANCE MINIMUM MAINTENANCE WITH HAVENS LONG LIFE BEARING DESIGNS



33 SERIES BEARING

Porous bronze bearings in zinc-plated cast iron housing. Stainless steel fan shaft. Extra large oil cup.



VERTI FLOW BEARING

Bearing assembly is supported by heavy structural members. All parts are corrosion resistant.

Write for FREE brochures on Havens Series 33 Cooling Towers and Havens Verti Flow Cooling Towers

Havens COOLING TOWERS

Division of
HAVENS STRUCTURAL STEEL COMPANY
1713 CRYSTAL AVENUE • KANSAS CITY 26, MO.

●

"Buffalo" reliability proved by three-quarters of a century

●

Efficient, hydraulically balanced double suction impellers

●

Oversize shaft with full ball bearing support at both ends

●

Rugged casing with ample, equal water passages for minimum friction and hydraulic balance

●

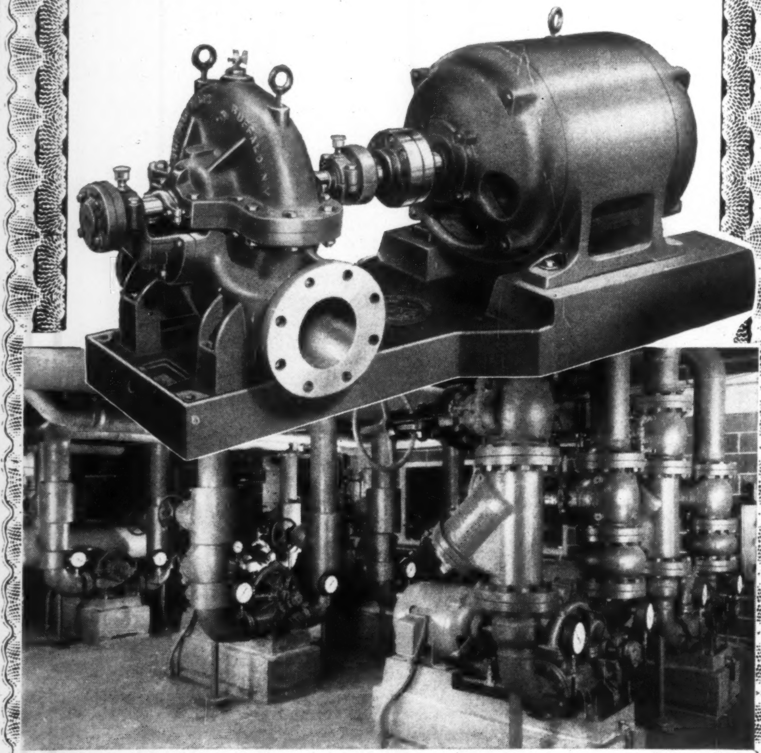
Large, 8-ring stuffing boxes

●

Easy servicing — upper casing half removable independently of piping

"Buffalo"

INSURANCE
OF PUMP PERFORMANCE



"BUFFALO" TYPE "SL" DOUBLE SUCTION PUMPS

IN YOUR INSTALLATIONS

In your air conditioning or other clear water installation, the pumps are the *small* part of your investment — yet their performance directly affect *overall* performance! Thus, you'll avoid expensive disappointments by selecting pumps of *unquestioned quality and performance* — "Buffalo" Type "SL" Double Suction Pumps — proved over and over in important installations. 10 to 14,000 gpm capacities. Write for Bulletin 955.

"Buffalo"

BUFFALO PUMPS

DIVISION OF BUFFALO FORGE CO.

171 MORTIMER STREET BUFFALO, N. Y.

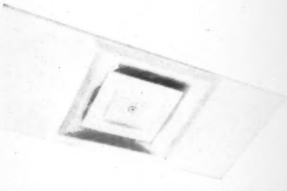
Canada Pumps, Ltd., Kitchener, Ont.

Sales Representatives in all Principal Cities

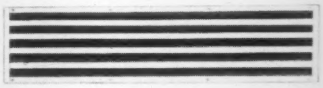
A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

THERE'S A KNO-DRAFT DIFFUSER FOR EVERY NEED

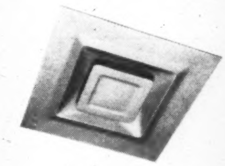
For residential, commercial or industrial installations . . . wherever effective, controlled air diffusion is needed . . . there is a Kno-Draft Air Diffuser to do the job better. Fully adjustable for both air volume and direction, Kno-Draft Air Diffusers are engineered to perform dependably for more working and living comfort, designed to complement any architectural motif. Kno-Draft Air Diffusers are produced exclusively by Connor Engineering Corporation.



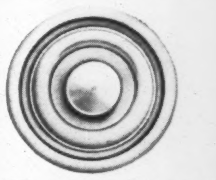
Panel type, for suspended acoustical ceilings. Two styles, three sizes to deliver from 75 to 175 CFM. Sleeve-type damper for instant volume control. One-piece pressed steel furnished in baked-on flat white enamel to match acoustical ceiling panels. Write for Bulletin K-36.



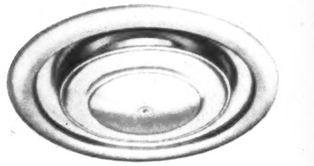
Slotted type KLS, for modern interiors. Effective diffusion assured by adjustable vanes, easy volume control by grid-type damper. Classic lines will enhance any decor. Available in 2-, 3-, 4-, 5- or 6-foot lengths for single or continuous installation. Write for Bulletin K-27.



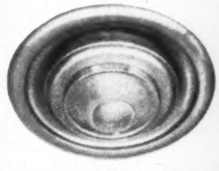
Square types KP and KPT, for flush ceiling mounting. In two smart designs: Type KP, overlap design for plaster ceilings; Type KPT, to snap into T-bar grid of acoustical tile ceilings. Both engineered to assure complete, dependable diffusion. Write for Bulletin K-27.



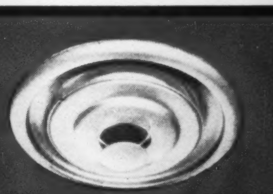
Type SRD, combination supply-return. For use where air is supplied and exhausted through one unit. Supply air cannot "short circuit" into return air opening. Built-in dampers provide independent supply and return air volume control. Of spun aluminum. Write for Bulletin K-20A.



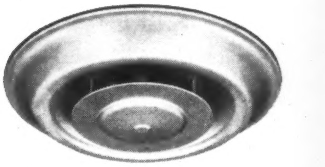
Type KDA for all-purpose use. The diffuser specified most by architects and engineers. Adjustable for air volume and diffusion pattern after installation. Spun aluminum construction. In all sizes for flush ceiling or exposed duct mounting. Write for Bulletin K-20A.



Type KDA with built-in light fixture. Combines attractive lighting and controlled air diffusion. Solves many installation problems. In design and application, this functional diffuser has all the features of the standard type KDA shown at left. Write for Bulletin K-20A.



Type SPKR, combination speaker-air diffuser. For P.A. or piped music systems. Provides same central location for both sound and air diffusion. Accommodates any extended range 8" speaker. Specifications are same as those of standard Kno-Draft types described in Bulletin K-20A.



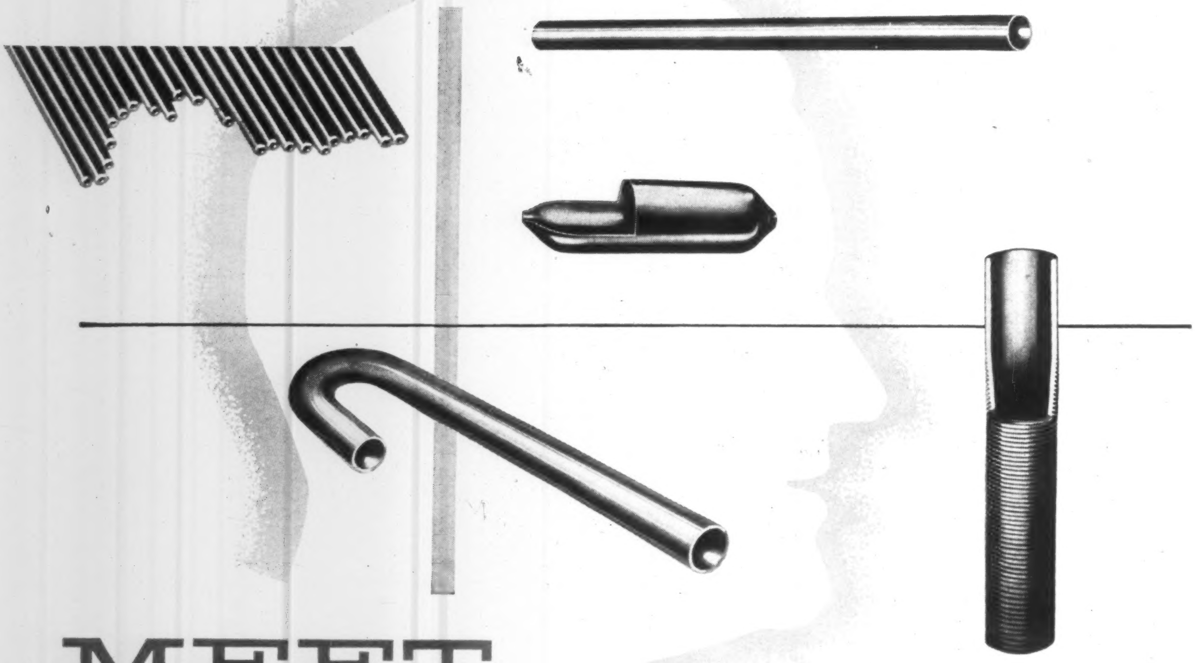
Type KH, for residential use. Pre-engineered for both heating and cooling applications. Easily installed, may be used with either round or rectangular ductwork. An exclusive integral anti-smudge cone eliminates unsightly ceiling smudge. Provides quiet, draftless air diffusion. Type KH-L, at right above, incorporates a smart lighting fixture that may be used with either a 75- or 100-watt lamp. Illumination and air diffusion are thus combined in a single unit. Both KH and KH-L units are made of spun steel, with aluminum lacquer finish. Write for Bulletin KH-76A.

Type KDA, for butting against walls or columns. Half-round design for use where standard diffusers would not be suitable. Features include Kno-Draft precision air pattern adjustment and sleeve-type damper (optional). Spun aluminum construction. Write for Bulletin K-31.

CLIP THIS PAGE— CONNOR KEEP IT AS A HANDY REFERENCE GUIDE

CONNOR ENGINEERING CORP.
DANBURY, CONNECTICUT

kno·draft®
adjustable air diffusers



MEET THE MAN

who has the answers to tubing problems

He has specialized training—is backed by a complete product line—and is ideally prepared with the right answers to your tubing problems.

For example, he can help you answer problems dealing with alloy selection, fabrication costs and product application. He can furnish commercial copper tube in both straight lengths and coils from a wide range of alloys and sizes. To meet heat transfer problems, he has both prime surface and integrally-finned Wolverine Trufin® condenser tube in many sizes and alloys.

He can suggest a bent tube or spun end part—or tiny Wolverine Capilator®

When you need more technical advice on problems such as corrosion, design, or packaging he'll introduce you to the tube technicians from Wolverine's Field Engineering Service.

Write for a copy of Wolverine's General Products Catalog. And call the Wolverine office nearest you when you want the man who has the answers . . .

HE'S THE WOLVERINE SALESMAN

Consult the
Yellow Pages
under "Tubing"

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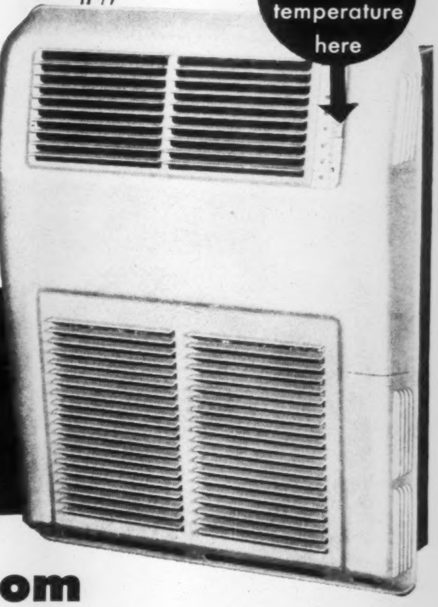
REVOLUTIONARY *new* HEATING FOR BUILDINGS

IRON FIREMAN SelecTemp®



a thermostat in every room

When every room is a separate heating zone, many of the problems that a conventional system can't touch are solved automatically . . . and with the SelecTemp heating system, they are solved economically. For example:

1. Tenant satisfaction is assured because occupants have independent control of room temperatures. They select the temperature they want.
2. Rooms are always comfortable, whether on the cold or warm side of the building, because the ever alert mechanism in each unit automatically adjusts for extra heat loss or gain, and supplies the right amount of heat needed at the right time and in the right place. Each unit takes care of its own room no matter how conditions may vary in other parts of the building.
3. Owners report substantial fuel savings because room-by-room control does away with overheating. *Heat is not wasted through open windows.*
4. The SelecTemp heating system can be economically installed in either new or existing buildings. Operating costs are low. Money can also be saved by heating only the rooms in use. The temperature can be lowered in rooms temporarily unused—then when these rooms are needed, they can be quickly reheated.

For cooling. Individual unit cooling combined with SelecTemp heating is the perfect combination for year 'round comfort, with room-by-room control of both heating and cooling.

Send for free literature. Iron Fireman will gladly send you a free booklet describing the SelecTemp heating system. Get all the facts—fill out the coupon below.

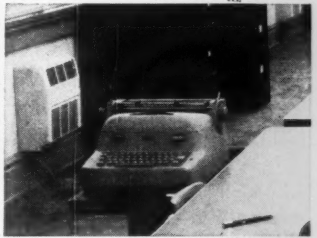
MORTON SALT COMPANY CUTS FUEL COSTS 57%

Manager of Wadsworth, Ohio office writes:

"Our former steam system was controlled by one master thermostat. We had room-heat fluctuations from 5 degrees to 25 degrees in the general office and in seven enclosed offices, resulting in absenteeism loss of 343½ working hours, because of illness due to colds. With SelecTemp heating during the season just ended we had absenteeism loss of only 75 hours.

The cost for heating in the 1954-1955 season was $1,361.13. Our cost for SelecTemp heating in the colder, longer 1955-1956 season was $586.25 or an actual saving of $774.88. However, we have had some increases, ie: Increased comfort, increased employee morale and increased attendance."

S. A. Carlson
Office Manager



Small, compact units

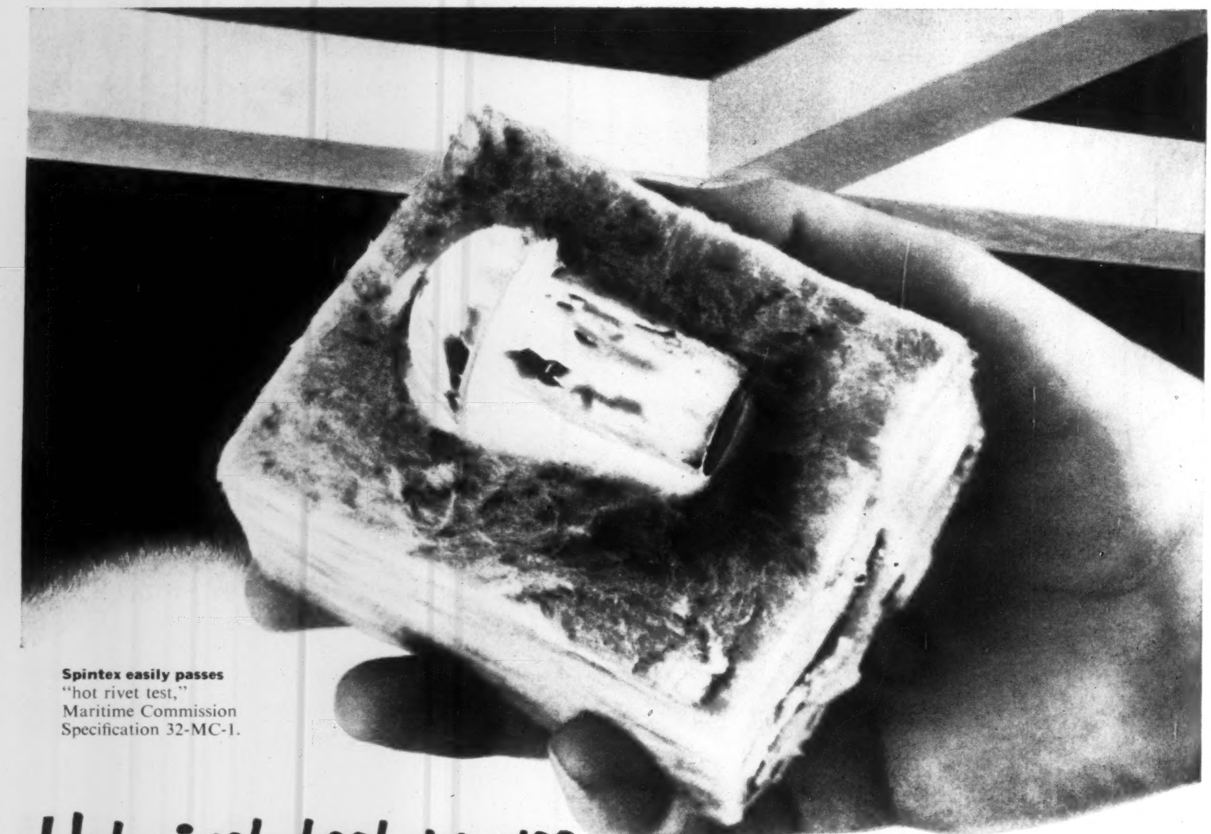
Only 18 inches high, the SelecTemp units are recessed in walls; take no floor space. Each unit complete with its own thermostat, air filter, heat exchangeer and steam driven fan. Steam is supplied by a low pressure boiler, fired by oil, gas or coal, or from district steam lines. Units can be painted to match walls.

IRON FIREMAN®
Engineered
HEATING AND COOLING

IRON FIREMAN MANUFACTURING CO.
3363 West 106th Street, Cleveland, Ohio.
(In Canada write to 80 Ward Street, Toronto)

☐ Send SelecTemp specifications and full information.
☐ Arrange for brief demonstration of SelecTemp room unit, in actual operation, in our office.

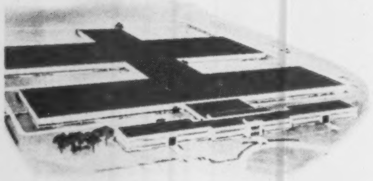
Name____________________
Firm____________________
Address____________________
City__________ Zone____ State______



Spintex easily passes
"hot rivet test,"
Maritime Commission
Specification 32-MC-1.

Hot rivet test proves

J-M Spintex duct insulation offers unsurpassed fire safety!



IBM uses Spintex for 205,000 sq. ft. of duct! New 781,000-sq. ft. IBM plant, Kingston, N. Y., is fully temperature-conditioned for more efficient production of electric typewriters and electronic computers.

Architects: Giffels and Vallet, Inc., L. Rossetti Assoc., Detroit, Michigan.

Spintex offers the fire-stopping advantages duct insulation must have! It will neither burn nor smoulder, and fire simply will not travel along a Spintex insulated duct.

Produced by a new Johns-Manville spinning process—new Spintex® is greatly improved. Its mineral fibres are measurably smaller in diameter and substantially more uniform. This improved fibrous structure adds countless heat-stopping dead-air spaces to every cubic inch . . . helps you maintain comfortable working temperatures at lower operating cost than ever before.

Spintex installs quickly . . . easily!

Spintex is clean, sanitary and "friendly" to handle and work with. It cuts readily with an ordinary knife. And it is easily and quickly installed even where ducts are curved or in difficult-to-reach places.

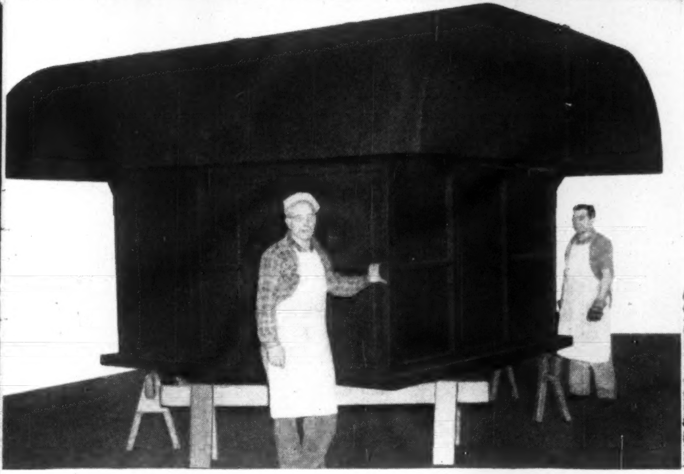
Spintex improves duct appearance in plant or office

Air conditioning ducts insulated with Spintex are neat and attractive, with trim, tidy joints. To meet unusual conditions or decorative needs Spintex is regularly furnished in a variety of special surfacings.

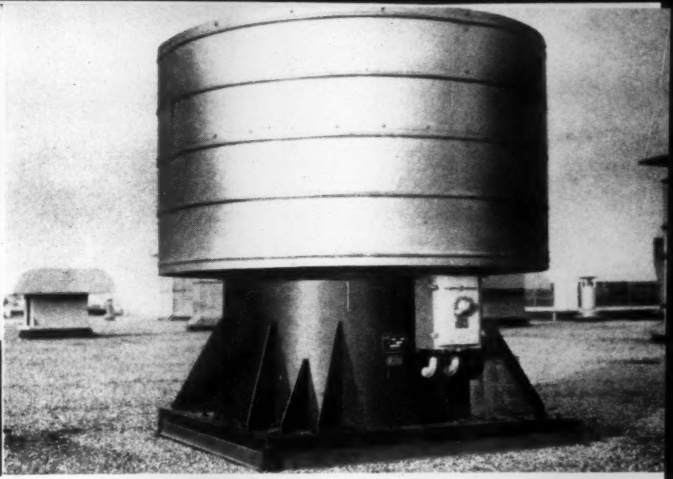
For more information and samples, contact your nearby Johns-Manville sales office. Or write Johns-Manville, Box 14, New York 16, N. Y. In Canada, Port Credit, Ontario.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville *first-in* INSULATION
MATERIALS · ENGINEERING · APPLICATION



Style "H" Sky-Vent, 84" size (100,000 CFM), one of four now ventilating a new public utility power plant in Michigan. Shipped as a complete preassembled unit.



66" Style "V" Sky-Vent exhausting 98,000 cfm from enameling oven area of a major appliance factory in Kentucky; one of 16 such units at this plant.

EASY TO INSTALL "BUFFALO" SKY-VENT® PACKAGE ROOF VENTILATORS OFFER RUGGED CONSTRUCTION–MAINTENANCE-FREE OPERATION

Here are extremely rugged power roof ventilators with important advantages to you and the customer:

1. For exhausting or ventilating large areas where ductwork may not be desirable.
2. In large capacity range, 1000 thru 250,000 cfm, to permit a minimum number of roof installations — reducing costs.
3. Shipped as ready-to-install units — saving you time and trouble.
4. Built to last! Heavy-gauge stacks with integral curb flanges. Internally braced hoods — moisture proof, wind proof, corrosion resistant.
5. Efficient air handling with standard lines of "Buffalo" Propeller and Axial Flow Fans.

Write for Bulletin FM-2345 and check these increasingly popular package units against your requirements. Your assurance of performance is the "Q" Factor in every "Buffalo" product — the built-in Quality which provides trouble-free satisfaction and long life.

VENTILATING

AIR CLEANING

AIR TEMPERING

INDUCED DRAFT

EXHAUSTING

FORCED DRAFT

COOLING

HEATING

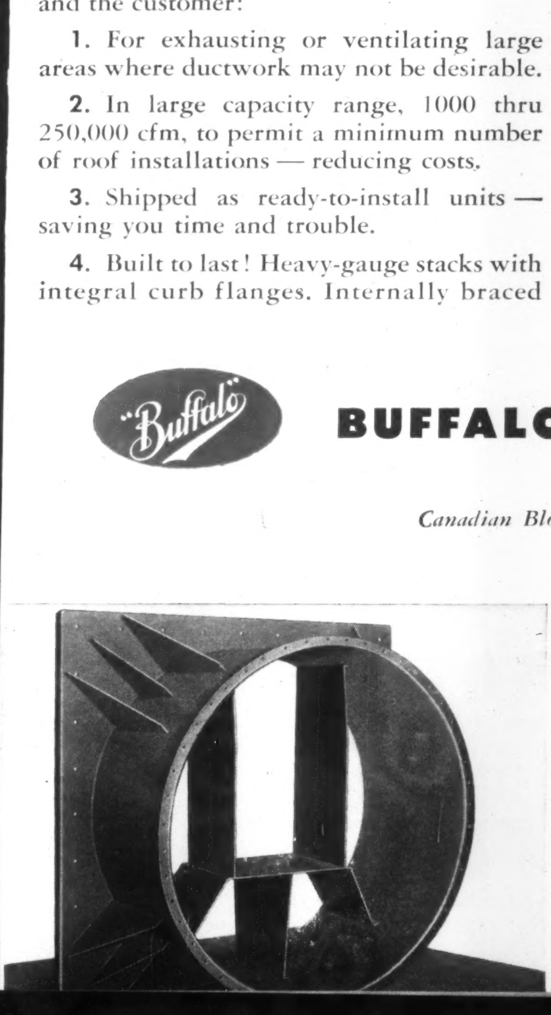
PRESSURE BLOWING

"Buffalo"

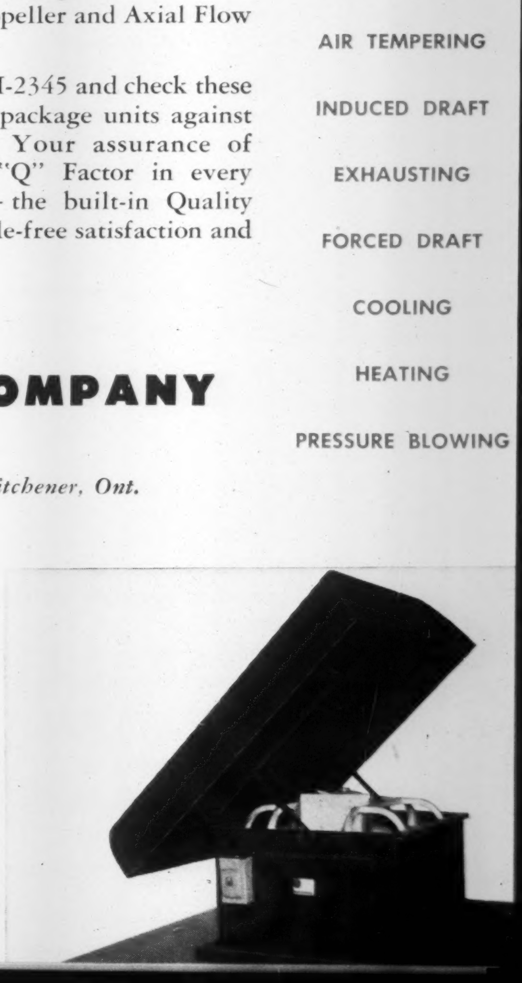
BUFFALO FORGE COMPANY

BUFFALO, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.



Rugged construction clearly indicated in view of 66" Style "V" stack. Note ample heavy stack bracing and internal plate gussets to support heavy motor.



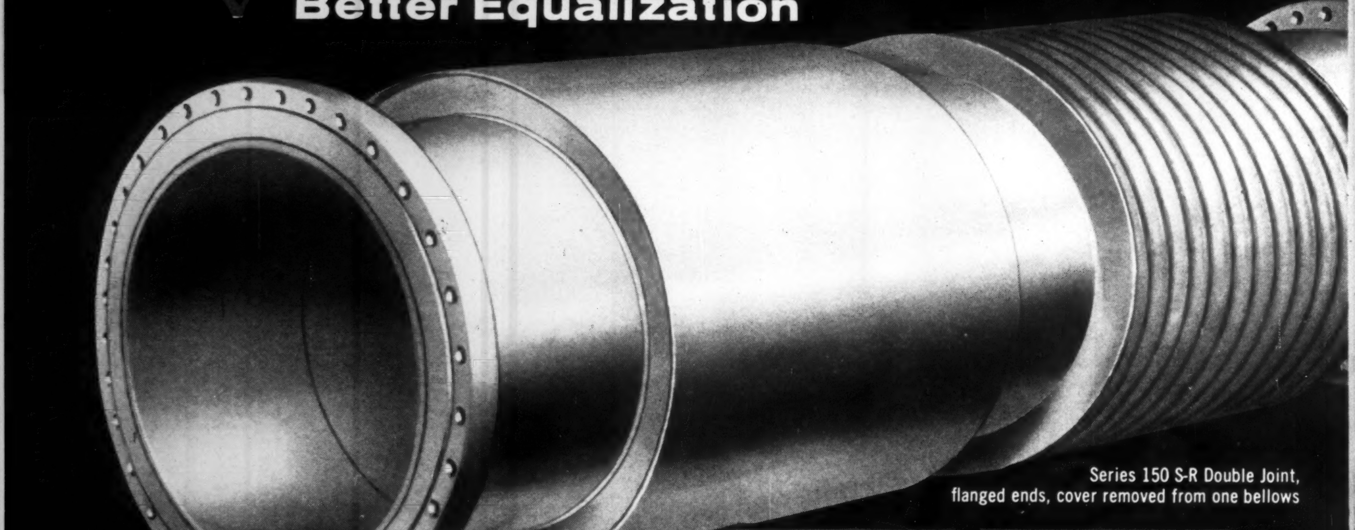
Right, showing raised hood of 42" Style "H" unit. Note rigid internal tubular frame in head, easy access to motor and neat appearance — units spray-coated both inside and outside with ⅛" thick cork impregnated fire and moisture resistant compound.

NEW EXPANSION JOINT DESIGN *from the world's most experienced manufacturer*

✓ **Up to 50% Less Weight...**

✓ **Longer Cyclic Life...**

✓ **Better Equalization**



Series 150 S-R Double Joint,
flanged ends, cover removed from one bellows

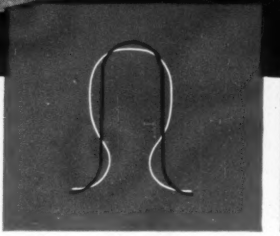
Intensive research program pays off in revolutionary design of Badger S-R Expansion Joints

BADGER S-R Packless Corrugated Expansion Joints — an entirely new design — are now ready for your most exacting power, heating, industrial and process piping applications.

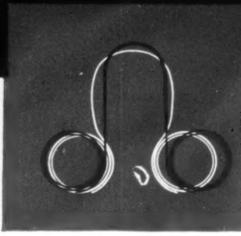
Two significant features of Badger S-R Joints are 1.) Curvilinear Corrugations, which result in natural "all-curve" flexing and more equal distribution of movement among the corrugations; 2.) tubular Reinforcing Rings, which work with the new corrugations to produce greater effective flexing height and "all-curve" flexing even under higher pressures and temperatures.

And there are other important features, too . . . size for size, Badger S-R Joints weigh up to 50% less than conventional types . . . new ring design reduces joint diameter . . . a complete line of accessories — including covers and liners — are available . . . standard models in stainless, monel and inconel, special types in any workable alloy.

Write for illustrated brochure today!



Series 50 corrugation cross-section



Series 150 corrugation and ring cross-section

New corrugation and ring designs produce better equalization, "all-curve" flexing.

The radically different Curvilinear Corrugations used in Badger Series 50 S-R Expansion Joints were developed by the Badger Research Department. When under operating pressure (white line in cross-section above), the new design produces more uniform movement per corrugation and natural "all-curve" flexing. These features result in lower stresses and therefore increased life.

Series 150 S-R Joints also feature Curvilinear Corrugations and, because they are used at higher pressures, have tubular Reinforcing Rings. These new rings make metal-to-metal contact only in the "valley" of each corrugation yet allow natural "all-curve" flexing (white line). The tubular shape of the rings also permits greater effective flexing height and therefore contributes to longer joint life.

BADGER

S·R

SERVICE RATED

EXPANSION JOINTS

BADGER MANUFACTURING COMPANY • *230 Bent St., Cambridge 41, Mass. • 60 East 42nd Street, N. Y., N. Y.*

© 1957 BMC

New Revolutionary Steam Trap

One large capacity seat for all pressures!

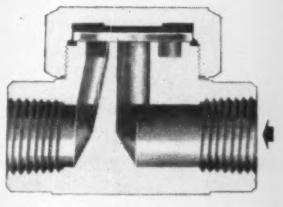
SARCO
3/8"
Thermodynamic
STEAM TRAP
PAT. PENDING
ACTUAL SIZE

New Sarco Thermodynamic steam trap. Sizes ⅜ to 1"... each body as small as a tee fitting! Capacity is determined, not by a bulky body, but by the effective orifice, valve action, pressure drop and condensate temperature.

1. **Cuts trap inventory**
   With the revolutionary Sarco TD steam trap, you use exactly the same trap... with exactly the same large capacity seat... for all pressures 10-600 psi... for heavy, light or no condensate load. Sizes ⅜ to 1".
2. **All pressures 10 to even 600 psi!**
   ...without changes or adjustments. Self-adjusting. High pressure construction... at a low pressure trap price!
3. **Operates perfectly when pressure fluctuates**
   Absolutely no effect even from 600 to 10 psi! No water seal to evaporate. No adjustments.
4. **Widest capacity range**
   Same large capacity seat for 10 as for 600 psi. Pressures of incoming air and condensate INSTANTLY AND FULLY raises valve head (disc), permitting maximum discharge.
5. **Operates equally well on all loads**
   The same Sarco TD trap for heavy, light or no condensate load. No prime to lose. No adjustments.
6. **No oversizing worries**
   You can size the new Sarco TD steam trap for peak condensate loads... without risk of blowing steam on light loads... no prime to lose... no adjustments.
7. **No steam leak required**
   ...to operate the revolutionary Sarco TD steam trap (Pat. Pending). Closes tight against steam!

Convince yourself by 60-day trial... use coupon

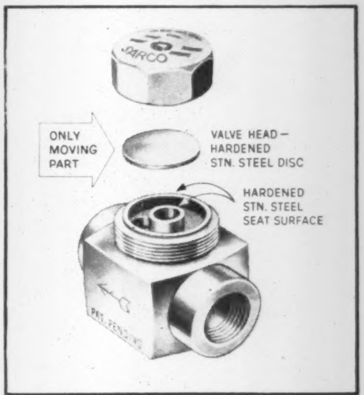
SARCO



Trouble-free design

Here is a trap so simple, it doesn't even have a valve closing mechanism. The kinetic energy of steam closes the valve. ONLY the new Sarco TD uses this operating principle.

No mechanism parts to wear or stick. No narrow channels to choke. No gaskets to leak.

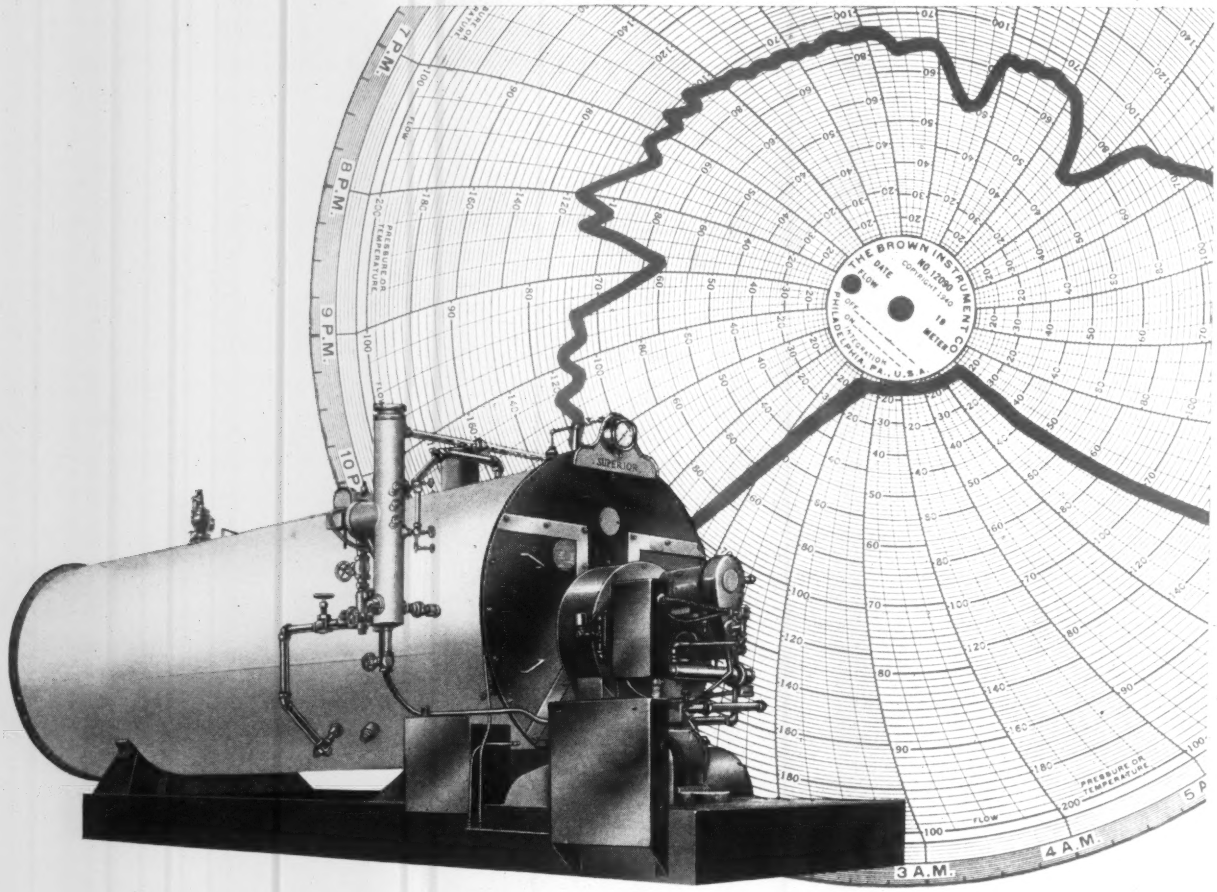

SARCO
ONLY MOVING PART
VALVE HEAD — HARDENED STN. STEEL DISC
HARDENED STN. STEEL SEAT SURFACE
PAT. PENDING

Maintenance practically eliminated

The all-stainless steel Sarco TD has only 3 parts... cap, disc and body. Only moving part is a hardened SOLID stainless steel disc, practically wear-proof.

SARCO COMPANY, INC.
Empire State Bldg., N. Y. 1, N. Y.

Please send me Sarco TD Steam Trap and strainer for 60-day trial.
Size______ For use on______________
____
Name____________________________
Firm_____________________________
Address__________________________
City________________**State**_______
2181-B



for Sharply Fluctuating Steam Demands . . .

Superior Steam Generators provide greater reserve

Designed with a large shell diameter and low water line, Superior Steam Generators provide extra steam storage space to meet sudden demands for steam. This feature makes Superior Steam Generators ideal for installations where steam requirements fluctuate sharply. The extra steam stored in the large boiler shell is immediately available as the need arises without the delay of waiting until the boiler catches up with the increased load.

Superior Steam Generators are available as completely integrated packages in sizes ranging from 20 to 600 b.h.p. for pressures up to 250 p.s.i. or for hot water. Before you buy, specify or recommend any boiler for new construction, or to replace or supplement existing equipment, learn the advantages of Superior Steam Generators. Write for Catalog 804F.

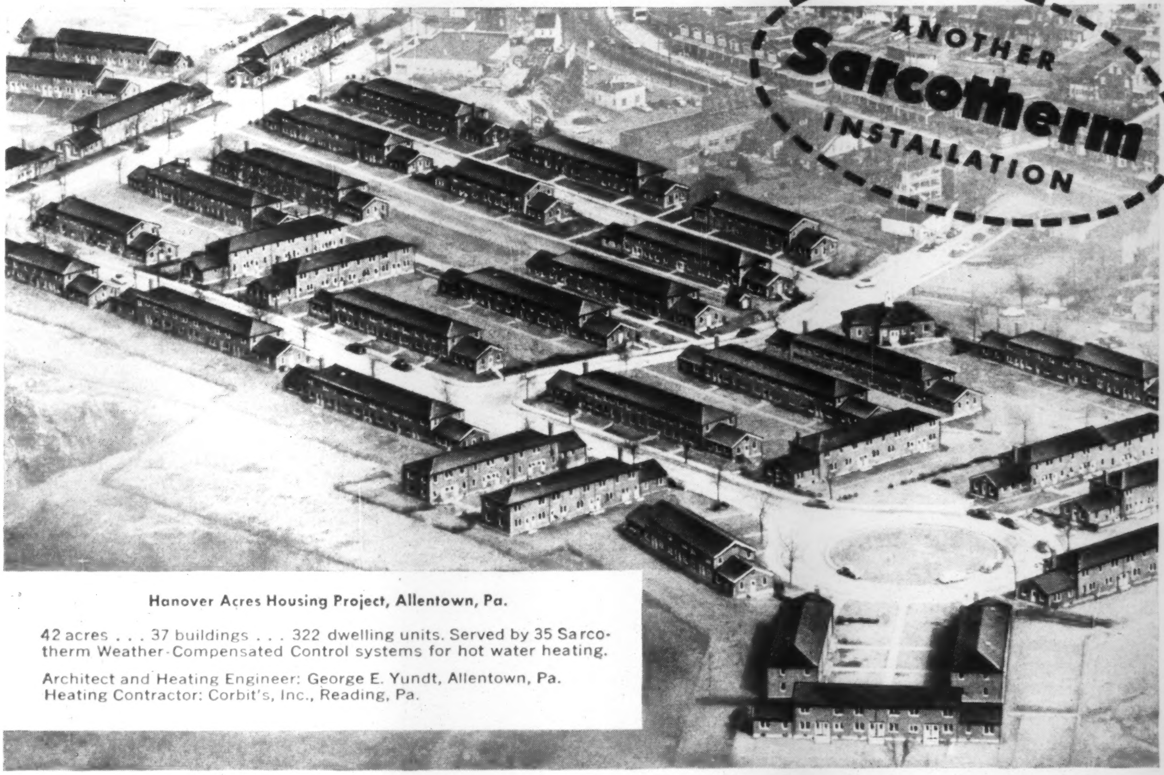
Check these design features:

- ✓ *Completely integrated design.*
- ✓ *5 sq. ft. of heating surface per b.h.p.*
- ✓ *Built-in induced draft.*
- ✓ *Fully automatic firing.*
- ✓ *Burns oil, gas or both.*
- ✓ *"Sized-to-capacity" boiler shells.*

for performance you can **BANK** on

SUPERIOR
STEAM GENERATORS

SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.



Hanover Acres Housing Project, Allentown, Pa.

42 acres . . . 37 buildings . . . 322 dwelling units. Served by 35 Sarcotherm Weather-Compensated Control systems for hot water heating.

Architect and Heating Engineer: George E. Yundt, Allentown, Pa.
Heating Contractor: Corbit's, Inc., Reading, Pa.

42 acres of comfortable heating ...for 16 years!

Provided by 35 Sarcotherm Weather-Compensated Control Systems

Here's the Test...35 Sarcotherm Systems...16 years on the job...serving 322 dwelling units at Hanover Acres Housing Project, Allentown, Pa. That's a tough test of heating control dependability and economy!

And here's the Result!...The Housing Authority of the City of Allentown reports...throughout the entire 16 years these Sarcotherm Weather-Compensated Control Systems for hot water heating have given trouble-free service and provided money-saving, comfortable heating.

Dependability-plus...that's one of the major reasons Sarcotherm Systems have been installed in many important projects including Hanover Acres and Beardsley Terrace Housing, Bridgeport, Connecticut.

For undivided responsibility on your installations, specify and order from one "Complete Line" source...SARCO-SARCOTHERM.

Write for catalogs. Sarcotherm Controls, Inc., Empire State Building, New York 1, N. Y.

ADVANTAGES OF SARCOTHERM SYSTEMS

On-the-job help—Sarcotherm engineers cooperate in preparing working drawings and wiring diagrams for each job. Also assist in supervising the installation.

Easy to maintain—simple, trouble-free design, fewer parts.

Easy to adjust—to any desired setting.

Complete Control Systems from Sarcotherm include all accessories such as control panels, thermostats, radiator valves, balancing fittings, steam traps, domestic hot water controls, etc.

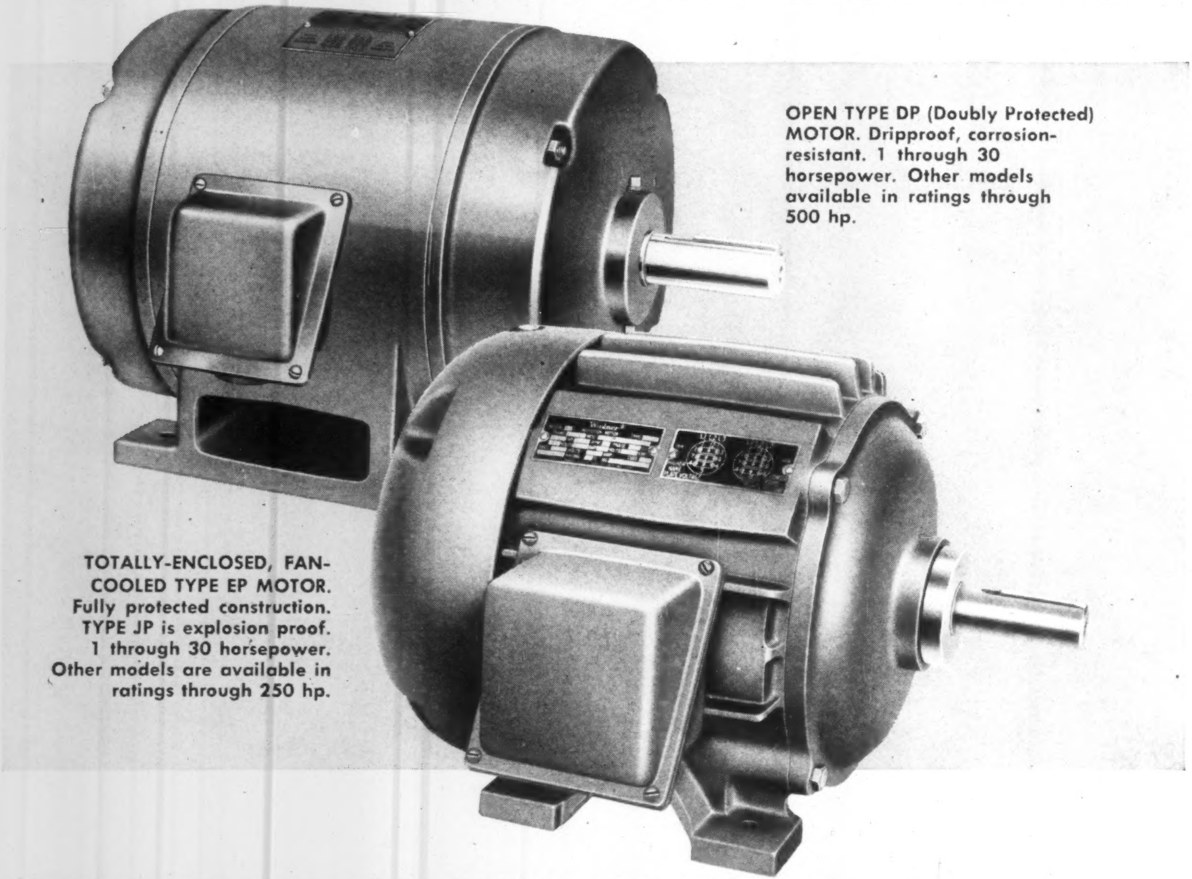
4008-B

Sarcotherm

AN AFFILIATE OF SARCO CO., INC.

Weather-Compensated control systems for steam, hot water and radiant heating

WAGNER ELECTRIC MOTORS... THE CHOICE OF LEADERS IN INDUSTRY



OPEN TYPE DP (Doubly Protected) MOTOR. Dripproof, corrosion-resistant. 1 through 30 horsepower. Other models available in ratings through 500 hp.

TOTALLY-ENCLOSED, FAN-COOLED TYPE EP MOTOR. Fully protected construction. TYPE JP is explosion proof. 1 through 30 horsepower. Other models are available in ratings through 250 hp.

OPEN TYPE OR TOTALLY ENCLOSED MOTORS...

Wagner offers MORE for your motor dollar!

- **MORE POWER IN LESS SPACE** . . . These motors are built in NEMA frame sizes 182 through 326 U. They pack more power into less space for easier handling and stocking—require less space for installations.
- **CORROSION-RESISTANT FRAMES** . . . Both types are built with rugged, corrosion-resistant cast iron frames. Motor feet are cast as an integral part of the frame for maximum strength and rigidity.
- **THE TYPE OF PROTECTION YOU NEED** . . . Type DP motors have completely dripproof—virtually splash-proof enclosures; while type EP is totally enclosed, fan-cooled for complete protection; and type JP adds explosion proof features.
- **COOLER OPERATION** . . . Special baffles direct a cooling flow of air through the DP motor. Types EP and JP are fan-cooled and have ribbed frames to increase the surface area for more efficient cooling.
- **LONGER BEARING LIFE** . . . These motors can be re-greased when desired to prolong bearing life. Fresh grease can be added—old grease removed through openings provided in the bearing housing.
- **WAGNER DEPENDABILITY** . . . These two motors have the same high Wagner quality, will give the same long life performance, that have made Wagner Motors a *known* value for sixty-five years.
- Let a Wagner field engineer, expert on motor applications, show you how these motors can be applied to your needs. Call the nearest of our 32 branch offices, or write us. Bulletins MU-202 and MU-203 give complete information on these Wagner Motors. Write for your file copies today.

M57-4

Wagner Electric Corporation
SERVING INDUSTRY SINCE 1891

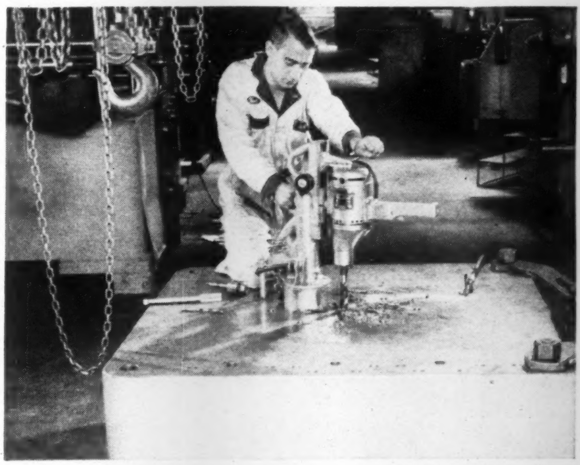
BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation
6370 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

Saves $100 per unit

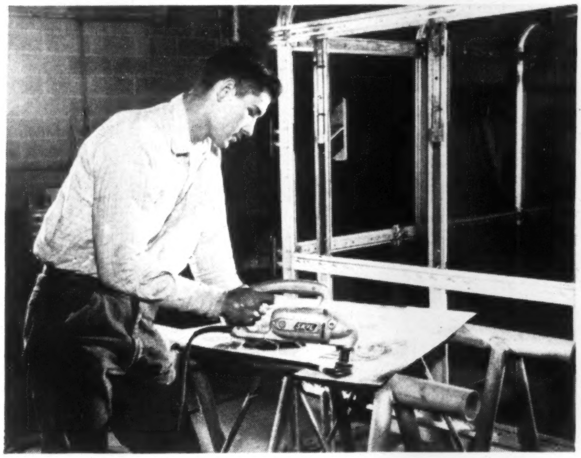
Griffin Tank and Welding Service of Dallas, Texas, custom builds geographic photographic equipment. This equipment must be lightproof, weatherproof, dustproof and air tight. "When SKIL drivers were substituted for hand tools for fastening, we saved over $100.00 per unit, and quality improved tremendously," says C. B. Jones, Chief Engineer.



Saves one operator

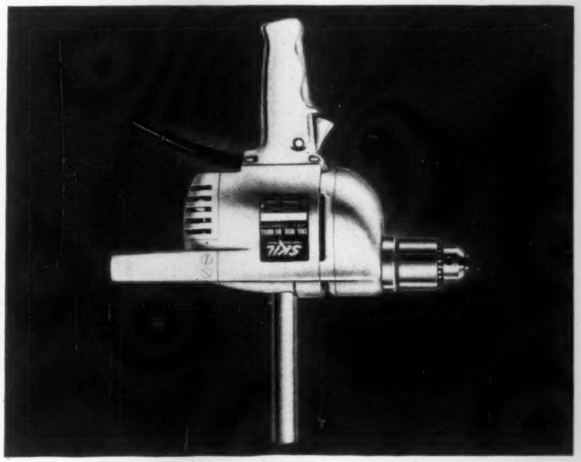
At Mercury Engineering Company, Milwaukee, Wisconsin, two men formerly handled the job above—drilling a 1⅛″ hole in 16″ steel. Then a SKIL Model 163 was tried. Now, one man not only drills, he also reams, taps and hones. "We always had good experience with all models of SKIL drills," says Ted Curtis of Mercury.

Metalworkers SAVE with SKIL tools



Saves $100 per week

"Our new SKIL Shear paid for itself in the first week," says J. M. McLain, owner of J. M. McLain & Sons Trailer Company, Houston, Texas. "In using other makes of shears we found that maintenance costs were about to run us out of business. Some operations were cut from 30 minutes to 1½ minutes. My men like SKIL shears because they are adaptable."



Save with New ½″ Model 80 Drill

All-new design: shorter, narrower—one pound lighter! New power for fast drilling on the toughest jobs. No matter what you have to drill, cut, sand or grind, there's a SKIL tool to do the job faster, better, cheaper. Let your SKIL distributor show you why. Let him show you the speed, power, versatility and ease of handling of all SKIL power tools.

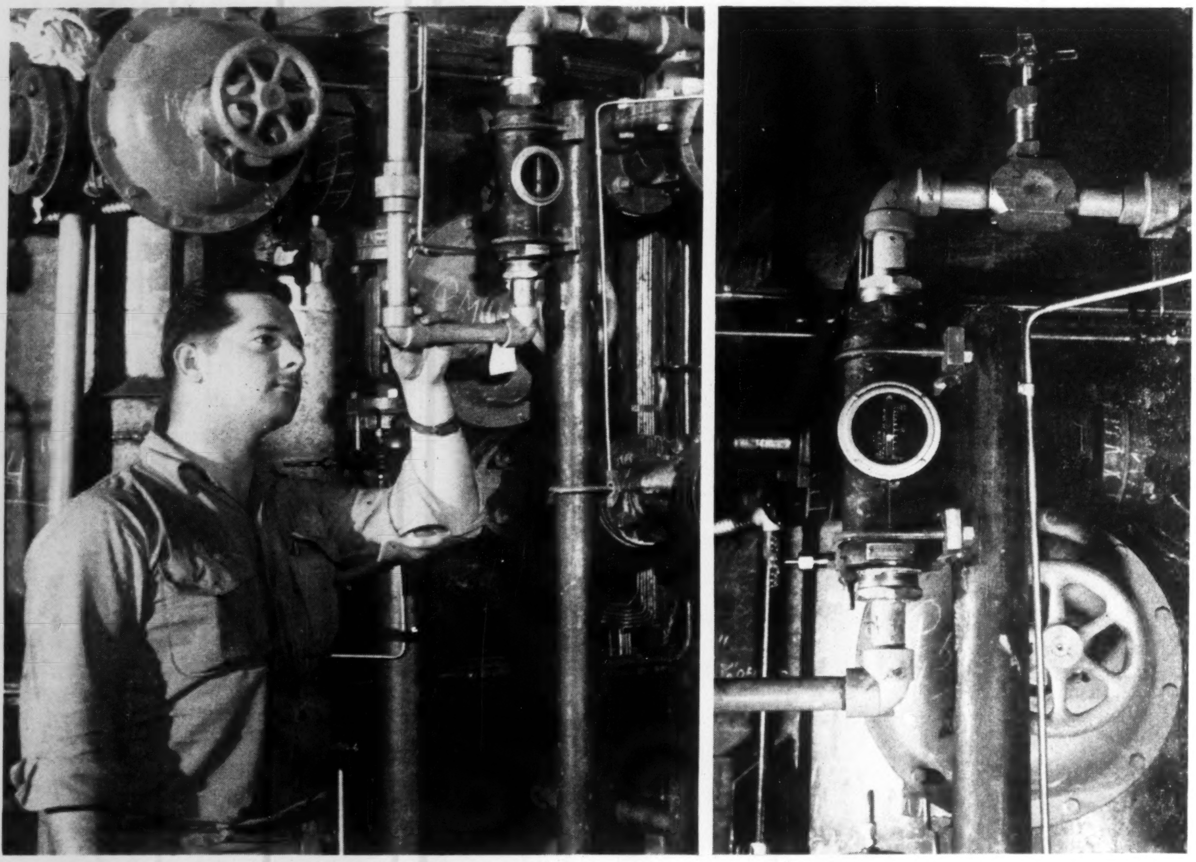
Write SKIL direct for free literature and the name of your nearest distributor.

Made only by SKIL Corporation, 5033 Elston Avenue, Chicago 30,
Illinois. In Canada: 3601 Dundas Street West, Toronto 9, Ontario.
Factory branches in all leading cities.

SKIL
PORTABLE TOOLS

News about

B.F.Goodrich Chemical raw materials



Here rigid Geon vinyl pipe is used in a demineralizer unit which treats boiler feed water. Piping handles caustic soda. View at right shows how Geon plastic pipe ties in to stainless steel valve and other metal parts. Pipe is made by National Tube; Vancor fittings by Colonial Plastics.

Unique chemical properties of Geon Rigid Vinyl Pipe

make new applications possible

FROM chemical plant piping to industrial water lines, from vent lines for acid fumes and corrosive gases to sour crude oil lines—the exceptional properties of pipe and fittings made from Geon rigid vinyls are making cheaper, longer-lasting and easier-to-install applications possible. The outstanding hows and whys include:—

- **Resistance to oils, acids, alkalis and most chemicals.**
- **High tensile and impact strength.**
- **Resistance to sunlight, fungi, bacteria, moisture, heat and cold.**
- **Smooth internal surface that reduces flow resistance.**
- **Ease of installation. Its light weight saves in freight, time, labor.**
- **It's a non-conductor—not subject to galvanic corrosion.**

These and other properties of Geon rigid vinyl pipe are helping engineers in a host of industries solve problems involving extreme operating conditions. Perhaps this remarkable material can supply the answer to your present and future problems. To find out how Geon can fit into your future, send for our new booklet on Geon 8700A and 8750. It gives detailed information about physical properties, applications and advantages of unplasticized polyvinyl chloride compounds. Just write Dept. FL-2,

B. F. Goodrich Chemical Company,
3135 Euclid Avenue, Cleveland 15, Ohio.
Cable address: Goodchemco. In Canada:
Kitchener, Ontario.

A TRADE MARK OF B. F. GOODRICH CHEMICAL COMPANY
Geon
Polyvinyl Materials
A DIVISION OF THE B. F. GOODRICH COMPANY

B.F.Goodrich Chemical Company
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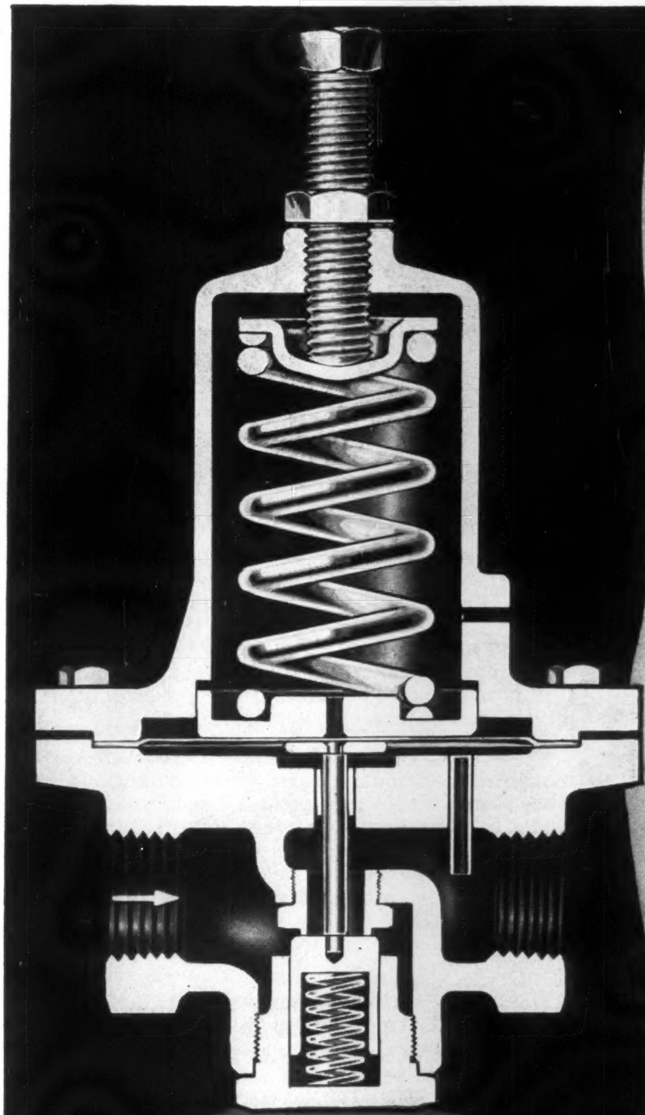
B.F.Goodrich **GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors**



FISHER®

Series 95

SELF-CONTAINED PRESSURE REGULATOR

. . . A simple, sturdy, self-contained regulator that is suitable for steam, air, gas, oil, water and other fluids.

SERIES 95 features hardened stainless steel trim . . . flat seat . . . machine lapped seating surfaces for tight shut-off for high temperature steam service.

Also available with soft seat construction for low temperature service.

Sizes: 1/4", 3/8", 1/2", 3/4", 1". Outlet pressures from 2 to 30 PSI; 15 to 150 PSI.

Size for size, compare its capacity.

Write for Bulletin C-95.

FISHER GOVERNOR COMPANY
Marshalltown, Iowa
Woodstock, Ontario

LEADS THE INDUSTRY IN RESEARCH FOR BETTER PRESSURE AND LIQUID LEVEL CONTROL

FISHER

Since 1880

THIS "Poison gas"... COMMON IN HOUSEHOLDS, IS DEADLY TO BUILDINGS!

Huge quantities of a dangerous, invisible gas are generated by the normal daily household activities of an average American family of four; enough to condense into 76 quarts of a destructive liquid each week.

The soil under a building, especially in a crawl space, may also give up this gas at the rate of 336 quarts per week per 1000 sq. ft., when liquefied.

If this gas turns into liquid *inside* building spaces, it will foster the ROTTING of Wood, the CRUMBLING of Plaster, the PEELING of Paint, the RUST and CORROSION of Metal, even the BREAKING-DOWN of Brick, Concrete and Mortar.

This gas can also be a THIEF OF HEAT and FUEL in winter, as well as a destroyer of the building. With each pound of it that flows out of a building, there is an actual loss of 1060 Btu's of latent heat.

THERE IS A PREVENTIVE!

Aluminum has almost zero permeability to all gases, including the destructive gas of water, known as "vapor." Large quantities of vapor flow into ceiling and wall spaces, unless its path is barred. Condensation formation on or within scientific multiple aluminum insulation is minimized by the construction of multiple layers of aluminum, fiber and air spaces. Installation of this pre-fabricated material is easy. The aluminum sheets stretch with uniform depth from joist to joist , and are a continuous vapor-barrier up to 750 ft. long, without breaks every few feet. Vapor infiltration under the flat stapled flanges is slight.

The heat ray reflectivity of its aluminum surfaces is 97%; absorptivity and emissivity are only 3%. This is important because the flow of heat rays, or RADIATION, constitutes 50% to 93% of heat flow through building spaces (depending on direction). The multiple layers of aluminum and fiber retard CONVECTION, while CONDUCTION is slight through the low density, multiple air spaces.

National Bureau of Standards tests were made under various extreme wintry conditions with quantities of vapor, to find if condensation would form in air spaces where reflective insulation was installed below a wood floor over a crawl space. The results are reported in an interesting and informative booklet of the National Housing Agency, "Technical Bulletin #38." Just use the coupon to get a copy FREE.

THERMAL VALUES
Infra Type 4 Parallel Insulation

Up-Heat C .105*=3⅛" non-metallic insulation†
Wall-Heat C .068*=4¾" non-metallic insulation†
Down-Heat C .042*=7⅞" non-metallic insulation†

*Determined by method of National Bureau of Standards in H.H.F.A. Research Paper 32.
†Calculated on basis of limiting thermal values cited in Fed. Specs. LLL-f-321b; HH-I-585; HH-I-521c; HH-I-551a.

Cost installed between wood joists, material and labor, about 8¢ sq. ft.

Type 6 also available

Can be purchased everywhere through your preferred local dealer.

Infra Insulation, Inc., 525 Bway., N.Y.C., Dept H-4
Please send NHA's "Technical Bulletin No. 38."

NAME ______________________

FIRM ______________________

ADDRESS ______________________

The Editors' Pages

Lest We Forget

APRIL IS
USO
MONTH

EVEN IN THE so-called atomic age, manpower is the backbone of defense. Close to 3 million Americans are on duty around the world ready to protect democracy. But their off-duty welfare is a civilian responsibility.

For 16 years USO, a civilian organization supported entirely by voluntary contributions, has accepted the responsibility of helping to preserve and advance the religious, spiritual, social, welfare, and educational wellbeing of the Armed Forces.

Yes, national defense is the concern of all, and through USO we at home can back the effort in a positive way. Thus, in peace or war, our service forces shall not be forgotten.

Air Conditioning Show Draws Record Crowd

. . . 24,000 see displays

One of the nation's greatest industries, aiming to standardize the climate under every roof, reached a new peak last month at the 13th International Heating & Air Conditioning Exposition in Chicago.

Five hundred colorful displays filled the floor of the huge International Amphitheatre with more than 200 types of heating and air conditioning equipment.

Visitors flocked to the Amphitheatre from all parts of the U.S. and Canada, as well as Mexico. Overseas visitors registered from nearly 20 foreign countries as well. Attendance reached an estimated record total of nearly 24,000.

The Exposition was held under the management of the International Exposition Co. with headquarters in New York. E. K. Stevens, president, is manager.

The next exposition will be in Philadelphia in 1959. The Second Southwest Heating & Air Conditioning Exposition is scheduled for Dallas, Texas, in 1960. All of these are under the auspices of The American Society of Heating & Air-Conditioning Engineers. ǂ

VISITOR J. Clifford Byles, left, president of the Institution of Heating and Ventilating Engineers in England, discussed American methods of heating with R. W. Roose, Editor of HPAC, at the recent Heating and Air Conditioning Exposition in Chicago

159,000 Classrooms Needed Next Fall

. . . including 79,000 replacements

Public schools were short about 159,000 classrooms last fall, according to the U. S. Office of Education.

Approximately 2,295,000 excess pupils over the normal capacity of school buildings are assigned to half day or double shift sessions, to makeshift facilities, or to overcrowded rooms.

This current excess enrollment requires an estimated 80,000 new classrooms this fall. But 79,000 more rooms are needed to replace outmoded facilities.

During 1956-57 an estimated record of 69,200 classrooms are being built, compared to 62,800 classrooms last year. ǂ

Construction Awards Up 4 Percent in January

. . . in 48 states

Contracts for future construction in the U. S. totaled $2,299,554,000 in January, an increase of 4 percent over January 1956, according to Thomas S. Holden, vice-chairman of the F. W. Dodge Corp.

This is the first figure for total construction contracts ever compiled for the entire 48 states, and marks the inauguration of an expanded statistical service by the Dodge organization.

Contract figures for the 11 western states, never before available, indicate that the January total for that region was $521,264,000, up 13 percent above January of last year. The rise in the remaining 37 states was only 1 percent over the same period.

The western region accounted for 23 percent of total construction contracts during the month. This proportion has been speculated upon for years, but until compilation of these figures, no complete statistical evidence has been available.

Contracts for nonresidential buildings totaled $914,168,000 in January, an increase of 16 percent over January 1956.

Heavy engineering contracts at $568,820,000 were 9 percent below January of last year. Both major categories, public works and public utilities, fell below the levels of last year. ǂ

Oil Burner Shipments Rise 13 Percent

. . . in January

COMMERCIAL-INDUSTRIAL oil burner shipments in January 1957 were up sharply — 13 percent higher than in January 1956, according to R. H. L. Becker, managing director of Oil-Heat Institute of America, Inc.

Shipments of all types and capacities of commercial-industrial oil burners totaled 2390 this January, compared to 2114 for the same month last year.

In 1956, total shipments for the year were 5 percent greater than in 1955. Industry leaders expect a higher rate of increase for 1957 over 1956. ǂ

Compressor Shipments Up 37 Percent in 1956

. . . first 11 months

MANUFACTURERS' SHIPMENTS of compressor bodies used in air conditioning and refrigeration units were up almost more than 37 percent in the U. S. during the first 11 months of 1956 — latest figures available — as compared with the same period of 1955, according to Geo. S. Jones, Jr., managing director of the Air-Conditioning and Refrigeration Institute.

The figures, which do not include compressors used in household refrigerators, were compiled from reports made to ARI by manufacturers whose output is estimated to represent in excess of 90 percent of the industry.

Actual shipments for the 11 month period totaled 4,477,457 units. This does not include compressors designed for ammonia refrigerants.

Of the 11 month total for 1956, 255,348 of the compressor bodies shipped were of the type used in automotive air conditioning. A comparative figure for the same period of 1955 is not available, but 1955 total shipments amounted to 255,371 units.

Figures for compressor bodies, broken down by capacity, are as follows:

Horsepower	Units shipped, 1956	
	November	Jan.-Nov.
1/5 & under	22,216	508,248
1/4	55,737	749,629
1/3	19,191	299,140
1/2	33,663	448,336
3/4	13,820	693,635
1	63,602	851,074
1 1/2	34,735	344,912
2	3,121	70,408
3	4,486	109,916
5	3,235	84,220
7 1/2	2,023	48,759
10	477	9,090
15	239	3,527
20	202	2,781
25	87	1,796
30	567	6,648
TOTAL	257,401	4,222,109
For ammonia	134	1,863
For automotive	19,557	255,348
GRAND TOTAL	277,092	4,479,320

ǂ

Hotel Syracuse to Be Fully Air Conditioned

. . . first in upstate N.Y.

THE HOTEL SYRACUSE, biggest hotel in upstate New York, is getting a complete year 'round central air conditioning system, according to the Carrier Corp.

The nearly $3¾ million contract covers the hotel's 605 guest rooms and includes the modernization of present conditioning equipment used for public spaces.

When completed the latter part of this year, the 13 story hotel is expected to be the first fully air conditioned hotel in New York state outside of Manhattan.

Equipment required by the year 'round system, except the under-the-window conditioning units and connecting ductwork, will be located on the roof.

Included is a 390 ton capacity hermetic centrifugal refrigerating machine.

The high velocity induction room units will hang from the wall and can be individually regulated by the room occupant.

Conditioned air from the rooftop refrigerating machine will be distributed to the units at high velocity through small ducts.

Room air, induced into the unit by the air which has been conditioned by the rooftop apparatus, passes first through a lint screen and then through a coil containing hot or chilled water.

Warm water will be heated by the hotel's recently installed boilers. A cooling tower, also on the roof, will save approximately 95 percent of water used for refrigeration condensing. ǂ

New Construction Activity At Record February High

. . . big buildings gain

NEW CONSTRUCTION activity declined seasonally in February 1957, but the $2.9 billion of work put in place was slightly above the previous February record set in 1956, according to the U.S. Depts. of Commerce and Labor.

Outlays brought the total for the first two months to almost $6 billion, an alltime high for the January-February period. Seasonally adjusted, new construction was at an annual rate of $44.7 billion.

Private construction, nearly $4.3 billion in January and February, was about the same as that of a year ago. Industrial plants, office buildings, churches, schools, hospitals, and public utilities were at record levels, offsetting declines in dwelling units and stores.

Public construction activity, not quite $1.7 billion, was 11 percent above that of January-February 1956, and reflected record outlays for sewer and water facilities and schools. ǂ

"Quote"

"Corrective maintenance is the repair of breakdowns or the work most people wait for and call the cost 'maintenance.' Productive maintenance involves any repetitive function, such as inspection, adjustment, and correction that can be controlled by schedule."—*William C. Wallin, chief, plant engineering department, North Carolina Works, Western Electric Co., Inc., in an address at the recent 8th Plant Maintenance and Engineering Conference in Cleveland.*

Put Beauty in your Comfort Plans

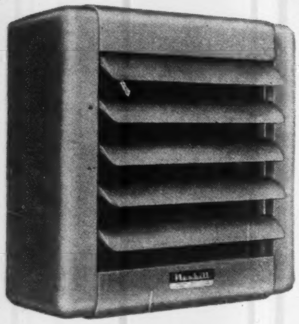
Behind the handsome exterior of the Webster Newport is personal comfort, for gentle warmth in winter, cool air in summer. Self-contained, hermetically sealed refrigeration cycle . . . needs no ductwork, no water, no cooling towers. Through-the-wall, room-by-room installation means economies in new construction and no loss of revenue during change-over in existing buildings. For steam or hot water heating systems.

With the Webster Newport, you get the service of Webster's Finest Product — the Warren Webster Man. Talk to him today . . . or ask for Bulletin B-2020. Warren Webster & Company, Camden 5, New Jersey. Since 1888. Offices in 66 Principal U.S. Cities and Canada.

Webster's Finest Product . . . the Warren Webster Man

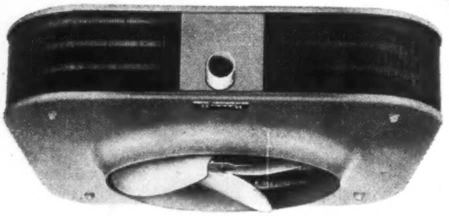
WARREN WEBSTER

HEATING . . COOLING



Propeller Fan Unit Heaters

Continuous-tube heating elements for steam or hot water; rear pipe connections permit maximum headroom; styled for modern interiors; gray-green baked enamel.



Little Giant Unit Heaters

Wrap-around universal heating elements; end pipe connections, motor removes from below, permit close-to-ceiling mounting; wide variety air-deflector attachments for vertical or horizontal discharge.

DOUBLE BARRELLED

The contractor who goes hunting for business armed with Nesbitt products brings home the profit! For instance, take these two companion lines: Nesbitt Propeller Fan Unit Heaters (24 models, 15,200 to 335,000 Btu/hr) and Nesbitt Little Giants (propeller fan units with blower fan performance; 34 models, 34,000 to 684,000 Btu/hr). They supplement each other to cover the whole range of propeller fan applications. With these two lines you are well armed—"double barrelled"—for selectivity and performance; ease of installation and economy; horizontal or vertical discharge; suspended or close-to-ceiling mounting; and (because of universal heating elements) for steam or hot water. And both lines are dependable—the capacities and sound ratings of every model have been tested in accordance with codes adopted by the ASHAE and the AMCA, Inc. For happy hunting, get to know these two lines better: send for Nesbitt Publication 412.

to cover the whole range of propeller fan unit heater applications

GIANT

Nesbitt *The name to go buy in* **UNIT HEATERS**

CABINET

BACKED BY 40 SUCCESSFUL YEARS—MADE AND SOLD BY JOHN J. NESBITT, INC., PHILADELPHIA 36, PA.

"Open for Discussion"

• WE FOLLOW HERE each month the practice at engineering society meetings of providing an "open for discussion" period. You are urged to take part. Just address your comments to the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.

Thermostats Should Be Marked Only with Plus and Minus Signs

I WOULD LIKE to comment on the question *How Can I Collect from Client?* asked in the November 1956 HPAC and answered by several readers in the January 1957 and February 1957 issues of HPAC.

I have experienced some calibration difficulties with clients in Germany in connection with thermostats and humidistats. One case may be cited where the client recorded the dry bulb temperature and the relative humidity that did not agree with the settings of the thermostat and humidistat. These records indicated that the thermometer and the relative humidity indicator had to be adjusted so that the correct conditions were indicated.

I do not think that the scales on these controls should be marked with degrees Fahrenheit or percent relative humidity. I believe that much more satisfaction would result to the owners and operators of heating and air conditioning systems if the scales were marked only with plus and minus signs. This would permit the owner to move the dials gradually for any increase or decrease in temperature or relative humidity as may be desired.

OSK. R. GAUBE
Toronto, Ont.
Canada

Client Should Be Made to Understand Design Conditions and Limitations

THE CONSULTANT with the question *How Can I Collect from Client?* is faced with a problem which I have encountered a couple of times. In comment:

1) The customer in this case does not fully understand the significance of 1 deg Fahrenheit. Because if the customer were told that a system designed to work on 15 F temperature difference was equipped with machinery to take care of such a load, he should understand that it is impossible to get from 95 F outside to 58 F inside, unless the system were designed accordingly. And I fully agree with the consultant that the occupants would not feel comfortable with such a difference in temperature.

2) I have been faced with such a customer. By investigation through his staff, I found that he was using that excuse to postpone payment of the job due to some other reason. This may be the problem this consultant is facing. Therefore I would suggest as a solution to the problem that the consultant go to see the customer with a big smile, and start to explain clearly paragraph No. 1, then without losing his temper tackle paragraph No. 2, trying to emphasize that the consultant's job is to help the customer as much as possible.

LOUIS P. TRUCHON
Josam Canada Ltd.
Quebec, Can.

Asks Permission to Reprint 16 Year Old Article

IN THE OCTOBER 1941 HPAC there was an article entitled *Sizing Vent Piping for Safety Valves* by Max W. Benjamin.

For some time we have used this article as a reference source for our engineering department and for our representatives calling on engineering designing firms and contractors.

This article has proven of such merit in aiding the design of vent piping for safety valves that we would like to reproduce the article and distribute it to our engineers and salesmen and to some of our customers who perform this type of design work.

F. M. REPASS
Chief Engineer
Consolidated Safety Valves
Manning, Maxwell & Moore, Inc.
Stratford, Conn.

Permission granted.

Believes Objections to "Shell Coefficient" Can Be Overcome in Practice

I WAS GLAD to have Lewis Smith's comments in the February HPAC on my article *Thermal Ratings of Buildings Can Be Uniformly Compared*, published in the September 1956 HPAC. He is correct as far as he goes in his objections, but I believe his objections can be overcome in practice.

At the present time, each heating engineer desirous of comparing two or more buildings would have to make a separate and complete analysis for each one, including in it assumptions and estimates which might vary from person to person. Each one must do it the "hard way." I believe that use of the "shell coefficient" will permit faster and easier comparison.

I feel that the type of occupancy, as Mr. Smith points out, is extremely important. Also, the height of the building, above a certain number of floors, may affect the estimate. Therefore, I would suggest that the "shell coefficient" be used as a base for estimates and modified by a factor for type of occupancy as required. Where the height of the building is so great as to indicate the need of further modification, this could be done. I believe that using a firm base will permit evaluation of these other factors based on comparisons with actual experience and costs.

Regarding Mr. Smith's other points, the comparison would be based on an average, not a uniform, temperature of 65 F. If the theoretical estimate indicates the cost of heating a building is being exceeded substantially because of the lack of skill or attention of the operator, or the reliability of the control, it might be advisable to replace either the operator or the control.

The type of fuel and heating plant will affect the heating cost. However, this is taken into consideration by using the cost per million Btu's in the calculations.

I concur in his statement that engineers sometimes add quite a factor in their calculations just to be on the safe side. For this reason, all too frequently an excessive amount of radiation is installed. Therefore the use of radiation to estimate heating costs may be open to question.

I would enjoy hearing any further comments from Mr. Smith or others, or seeing any data which could be used to set up a system of comparison.

WILLIE HAMMER
Chief, Heating Unit Repairs & Utilities Div.
Office of the Engineer
Hq. U.S. Army Forces, Far East

Base Bid Specifications Reduce Costs, Eliminate "Shopping" and Arguments

THE ARTICLE *Do 'Base Bid' Specifications Reduce Costs, Improve Quality in Heating, Piping, and Air Conditioning Jobs?* by Kenneth M. Wilson in the May 1956 HPAC expresses our feelings on this controversial question. Specifications written in this manner not only reduce average costs and eliminate "shopping" — with reduction to the owners — but also eliminate what are usually heated discussions on the job when we find an "equal" which is, in our opinion, not at all suitable.

This type of argument is encountered either at the submission of shop drawing stage or, in the case of miscellaneous materials, on the job, It is time consuming and costly for everyone, and many times carries over into continued hard feelings throughout the construction period.

We would like to particularly commend the wording of the "Materials of Approved Equal" and "Substitute" sections of the article.

By changing our selection of manufacturers of major items from one project to another, we seem to have avoided any comments concerning collusion or commissions.

N. E. JENNISON
Jennison Engineering, Inc.
Consulting Engineers
Burlington, Vt.

How Well Does Aluminum Resist Corrosion in Air Cooled Condensers?

I READ with interest the article *How, Where, and When to Use Air Cooled Condensers*, by Warren Viessman, in the September 1956 HPAC. Several questions came to my mind:

1) The article mentioned that casings and fins of these condensers are of aluminum or other corrosion resistant materials. What generally are these other materials?

2) Is the author familiar with installations having aluminum rather than copper coils? What factors have limited aluminum in this application?

3) What has been the author's experience corrosion-wise with aluminum in air cooled condensers?

4) The article refers to an air cooled condenser installation being made in Idaho. What is the specific location in Idaho, and is aluminum incorporated in the design of this condenser installation?

THOMAS A. LOWE
Research Engineer
Dept. of Metals Research
Kaiser Aluminum & Chemical Corp.
Spokane, Wash.

THE AUTHOR'S REPLY — The following information might be of some assistance.

1) Casings of air cooled condensers are made of aluminum for most applications, but have been made of copper, hot dipped galvanized sheet metal, and vinyl and paint coated steel.

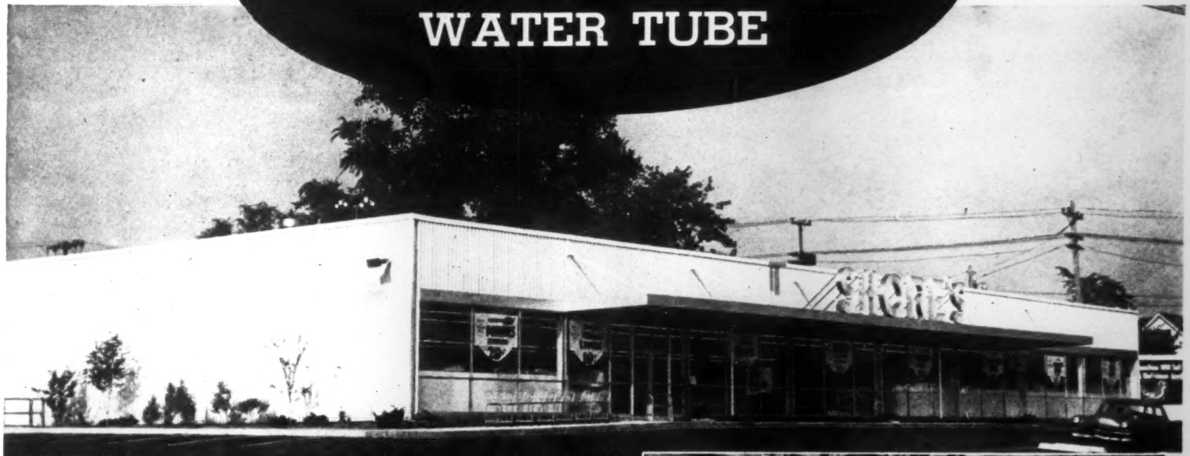
2) I have had no experience with aluminum coils. I suppose the limiting factors have been economy, physical properties, or engineering. I would suggest contact with manufacturers of air cooled condensers for a better answer.

3) Aluminum fins on copper coils have given very satisfactory service on the Florida East Coast and elsewhere. However, some portions of the Pacific Coast and the islands of the Pacific are considered to have a more severe salt spray and aerosol condition. Some engineers specify copper fins on copper coils.

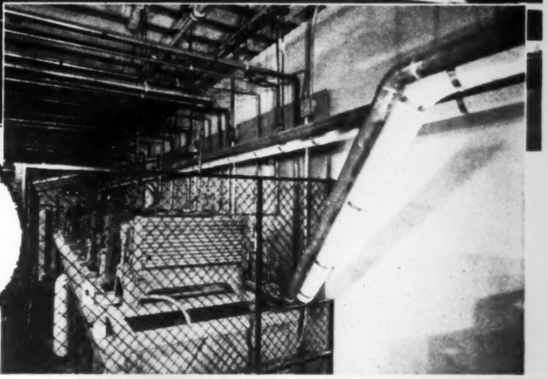
4) The Idaho installation has been approved, but I doubt if construction has progressed to any extent. I am not at liberty to elaborate on that installation, except to say that standard construction using copper for the coil and aluminum for the fins and casing will probably be specified.

WARREN VIESSMAN
Chief, Mechanical Branch
Installations Directorate
Hq Air Research & Development Command
Washington, D.C.

what they're saying about REVERE COPPER WATER TUBE



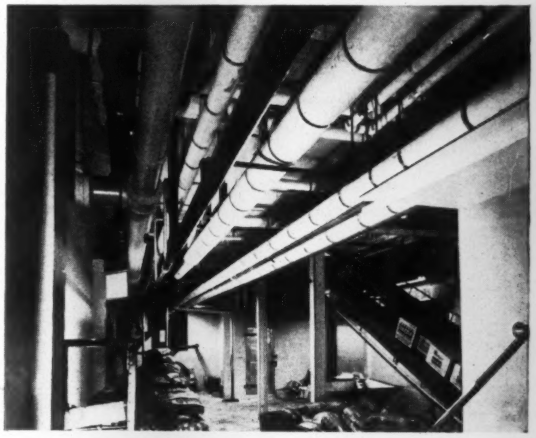
"There's nothing like it for running refrigeration lines, for economy and for ease of installation." says, William N. Harris, President
WILLIAM N. HARRIS, INC.
Pawtucket, R. I.



Architects: ESHBACH, PULLINGER, STEVENS & BRUDER. Consulting Engineer: A. ERNEST D'AMBLY, both of Philadelphia, Pa. Revere Distributor: R. I. REFRIGERATION SUPPLY COMPANY, Providence, R. I. Above photo shows compressor line-up in this 65-ton-capacity refrigeration layout. When you consider how long it would have taken if all the piping connections on this job had to be threaded, then you can readily understand why architects, contractors and engineers use Revere Copper Water Tube with soldered or brazed joints.

"As a refrigeration contractor I've found that nothing equals copper water tube for refrigeration and air conditioning lines. You can work in the tightest corners because the solder or brazed joints you make need no wrench room and you never have to worry about rust clogging the lines when you use copper tube. And because copper tube always makes a neat installation and is bright and shiny, you need never worry about exposing it. All things considered, copper costs less to install, too."

The words may be different, but we keep hearing the same saving story again and again. So why take chances? See your Revere Distributor for your copper water tube needs. And if you have technical problems, ask him to get in touch with our Technical Advisory Service for you.



Above photo shows insulated copper tube supply and return lines connecting cooling tower to compressors in Shore's Supermarket, East Providence, R. I. 2,500 FEET OF REVERE COPPER WATER TUBE in sizes from ½" to 3" were used. Refrigeration included storage room for frozen foods and meats, counter storage and sales areas.

REVERE COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N.Y.

Mills: Baltimore, Md.; Brooklyn, N. Y.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Newport, Ark.; Rome, N. Y. Sales Offices in Principal Cities, Distributors Everywhere.

COPPER ★ BRASS
1801
REVERE
ALUMINUM

What's the Correct Way to Trap Steam Headers and Tracing Lines?

This question was asked previously in HPAC and is repeated here along with some of the answers that have been received from readers. Several answers were published in the March HPAC.

> *"We have been having considerable discussion as to the correct method of trapping steam headers and steam tracing lines, and we would like to know if others have some suggestions.*
>
> *"We are confronted with determining the correct distance between traps on a steam header and on steam tracing lines. Steam pressures will vary from 2 psi to 400 psi. The tracing line sizes are from ½ in. to 2 in. in diameter. These installations will be in various parts of the country from Louisiana to Canada."—E.R.E.*

Put Traps at All Natural Drip Points And Between, Where Necessary

FOR TRAPPING high pressure steam mains under the conditions given by E.R.E., the following recommendations are made:

1) Traps should be installed at all natural drip points, such as:

a) Bottoms of vertical loops.

b) Ahead of risers.

c) Ahead of shut-off valves or reducing valves.

2) It is common practice to install traps anywhere from 300 to 800 ft apart on steam mains. If natural drip points are, say, 1000 ft apart, should one trap or two traps be installed between the natural drip points? This decision will be influenced by a number of variables, such as:

a) Quality of steam.

b) Amount of superheat.

c) Amount of insulation.

d) Location indoors or outdoors.

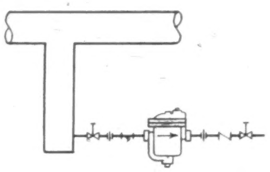
e) Diameter of main.

Variables a, b, c, and d affect the amount of condensate to be removed. The greater the amount of condensate formed in the main, the greater the need for a short distance between drip points.

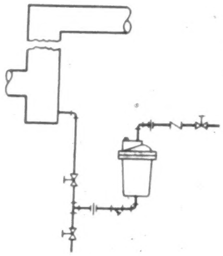
As for variable e, diameter of main, other conditions being equal, drip points on a 6 in. main should be closer together than drip points on a 12 in. main. Of course, smaller traps can be used on the 6 in. diam line than on the 12 in. main.

To calculate or guesstimate all variables affecting trap spacing may be more expensive than playing it safe by installing two traps at 333 ft intervals rather than one trap at 500 ft intervals.

3) When traps must be installed between natural drip points, provision should be made to divert the fast traveling condensate to the drip line. Almost useless is a 1 in. diam pipe welded to the bottom of a 12 in. diam main in which condensate is traveling at a rate of, say, 2000 fpm. As a minimum, a small dam welded in the bottom of the main just downstream of the drip point will divert normal amounts of condensate. A full size drip pocket, as shown in Fig. 1, or offset and drip pocket, as shown in Fig. 2, would be more expensive, but worth the extra cost.



1 DRIP POCKETS allow condensate to reach trap



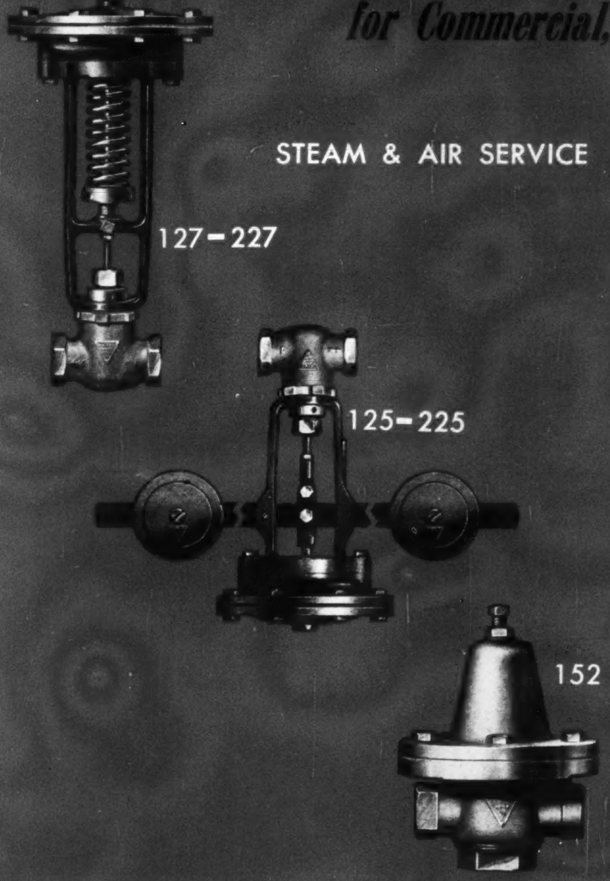
2 TRAPS should be installed ahead of loops and risers

(Continued on page 92)

PRESSURE REGULATORS

for Commercial, Industrial, Institutional application...

STEAM & AIR SERVICE



WATTS Nos. 127 and 125 Single Seated Pressure Regulators, Sizes ½″ to 4″. Initial pressures up to 250 lbs.

No. 127 spring type — Reduced pressure range 10 to 100 lbs.

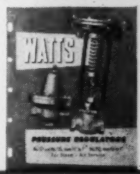
No. 125 weight and lever type — Reduced pressure range 1 to 15 lbs.

Furnished in bronze body construction with screwed ends up through 3″ size. Sizes 2½″, 3″ and 4″ may be furnished with standard or extra heavy flanged ends. Standard bronze trim or special metal alloy trim can be furnished.

WATTS Nos. 227 and 225 Double Seated Pressure Regulators, Sizes ½″ to 6″. Sizes up to 2″ are available with screwed or union ends. 2½″ to 6″ have standard or extra heavy flanged ends.

WATTS No. 152 Self-Contained Single Seated Pressure Regulator, Sizes ½″, ¾″, 1″.

Furnished in iron body construction with bronze trim for initial pressures up to 150 lbs. Reduced pressure ranges 5-40, 25-100 lbs. Furnished in bronze body construction for initial pressures up to 250 lbs. and reduced pressures up to 200 lbs.



For complete information

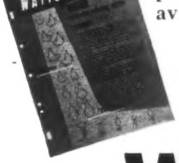
Send for . . .

Steam Catalog Folder F-127A.

WATTS No. 135 Self-Contained Reducing Valve, Sizes ½″ to 2″. All bronze unit incorporating integral strainer.

WATTS No. 223 High Capacity Self-Contained Reducing Valve, Sizes ½″ to 2″. All bronze construction. Also available with separate strainer. When furnished with separate strainer, specify No. 223S.

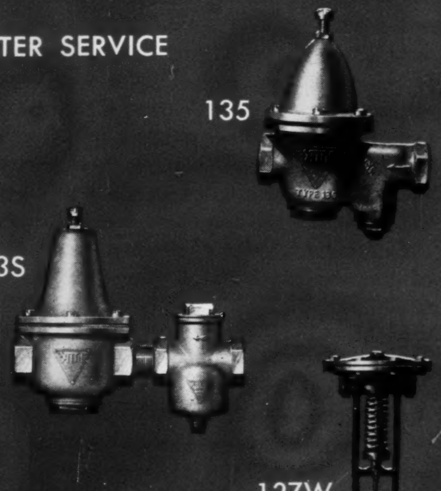
WATTS No. 127W Remote Control Diaphragm Spring Type Pressure Reducing Valve. Sizes ½″ to 3″. These valves have wide industrial applications where water reducing valves must reach full capacity with minor drop in reduced pressure. Initial pressures up to 250 lbs. Reduced pressure ranges available from 10 lbs. to 100 lbs.



Send for . . .

Folder F-135A with complete product details and specifications.

WATER SERVICE



WATTS *Regulator Company*

Lawrence, Massachusetts

(Continued from p. 90)

4) Steam mains at 2 psi, of necessity, must be short and velocities will be relatively low. The main should be pitched to give good drainage to a natural drip point or points.

For trapping steam tracing lines under the conditions given by E.R.E., we would recommend the following:

From the pipe size specification, we assume that iron pipe, rather than copper tubing, is used. We further assume that there are no "lifts" in the tracer line so that there will be gravity flow to the traps. Trap spacing should be such that the tracer line just ahead of the trap never will be completely full of condensate.

In some instances, the product flowing in the traced line is at a temperature higher than the steam temperature in the tracer line. That is, the tracer line does useful work only when product flow stops. Normally, then, the steam in the tracer line will be superheated. Nevertheless, the trap sizing and spacing must be on a saturated steam basis, with heat flow from the tracer line to the product line. We know of no rule of thumb for spacing or sizing tracer line traps.

When copper tubing is used for steam tracing, special problems likely will be encountered. It is not uncommon practice to wrap copper tubing around a horizontal product line. This creates a series of pockets in which condensate can collect and creates a much greater pressure drop between the steam supply line and the trap. Drip points should be at shorter intervals on such lines as compared with drip points on tracer lines having gravity drainage to the trap.

The statement "Installations will be in various parts of the country from Louisiana to Canada" suggests the need for protecting traps against freezing when installed outdoors.

Any type of trap installed outdoors will freeze if proper precautions are not taken with respect to trap discharge lines. Long horizontal discharge lines or vertical discharge lines create a trap freezing hazard. On light loads, ice can form in the discharge line and seal off flow. Once this happens, tracer line drainage will cease and the trap itself also will freeze.

To prevent freezing of inverted bucket, thermostatic, or thermodynamic traps, the trap discharge lines should be:

a) Short.
b) Pitched down to the return line.
c) With no elevation of condensate.
d) Well insulated.

The smaller the condensate load, the greater the need for following the above precautions.

T. H. Rea
Sales Manager
Armstrong Machine Works
Three Rivers, Mich.

Many Engineers Have Worked Out Own Formulas; Here Are a Few Examples

The proper drainage of steam tracer lines is becoming a very interesting problem and is still not completely solved to the complete satisfaction of every user. We are doing quite a lot of experimental work ourselves at this moment, but hesitate making a firm statement as to the best method and the best trap to use.

However, on steam mains, many engineers have worked out their own formulas and from talking to our own engineers the consensus seems to be that on lines $\frac{1}{2}$ to 1 in. in diam a trap is installed to drip the main every 150 ft. Should a reducing valve be installed in the line, proper drainage should be made at that point. Also should a riser go up from the header, it should be trapped at the low point. In general, main lines should have 1 in. of slope in each 30 ft. On mains 2 to 4 in. in diam a trap every 300 ft would drip the line; on 6 in. diam lines, every 500 ft. To insure proper drainage the line should always be trapped at the point of use, such as on unit heaters, kettles, and other equipment.

H. H. Maltbie
Manager
Strong, Carlisle & Hammond Div.
White Sewing Machine Corp.
Cleveland, Ohio

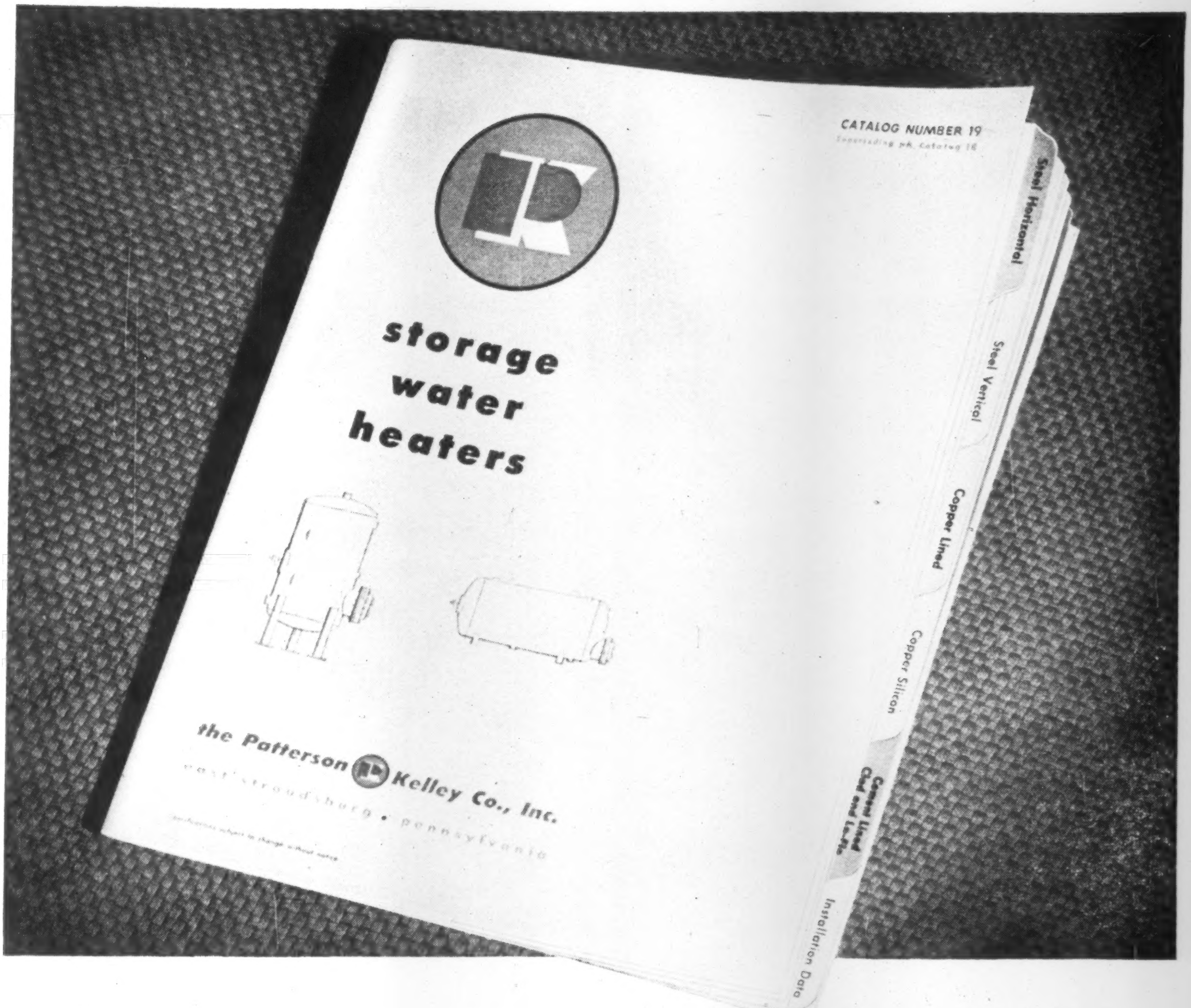
READER ASKS —

"How to Heat a Coal and Ore Thawing Shed?"

"We have been asked to design the heating system for a coal and ore thawing shed where the temperature is to be maintained at 200 F. It has been suggested that direct fired heaters be used to satisfy this requirement. If direct fired heaters are to be used, the air within the shed is to be recirculated through the heater continuously. Ducts will be used to distribute this heated air to the locations in the shed where it will do the most good in the thawing operation. The ice crust around the perimeter of the coal and ore cars is about 15 in. thick under design conditions.

"We are interested in knowing what experiences others have had with this type of application, so that our judgment may be tested and made wiser in the design of the heating system. All comments about this will be greatly appreciated." — R.C.B.

• *YOU ARE INVITED to contribute a question for publication or an answer to a published question. Write: The Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*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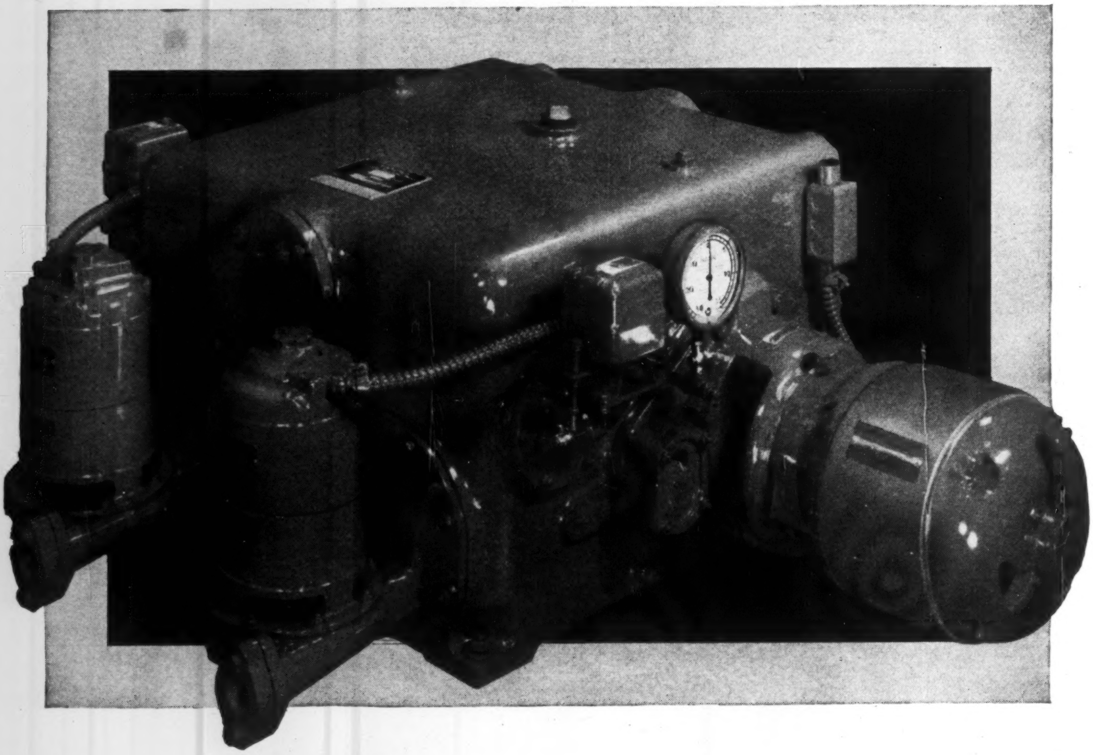

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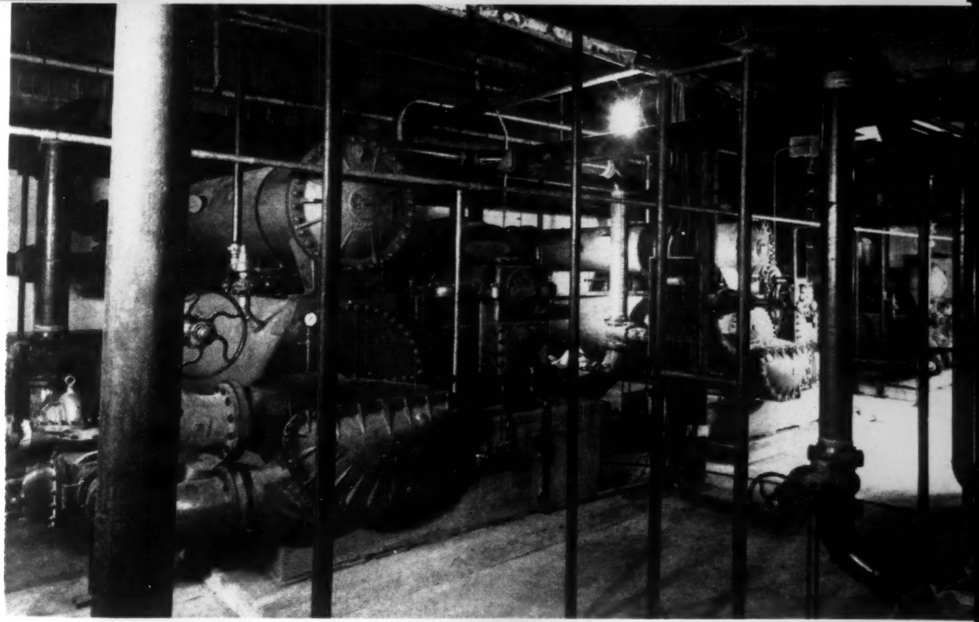
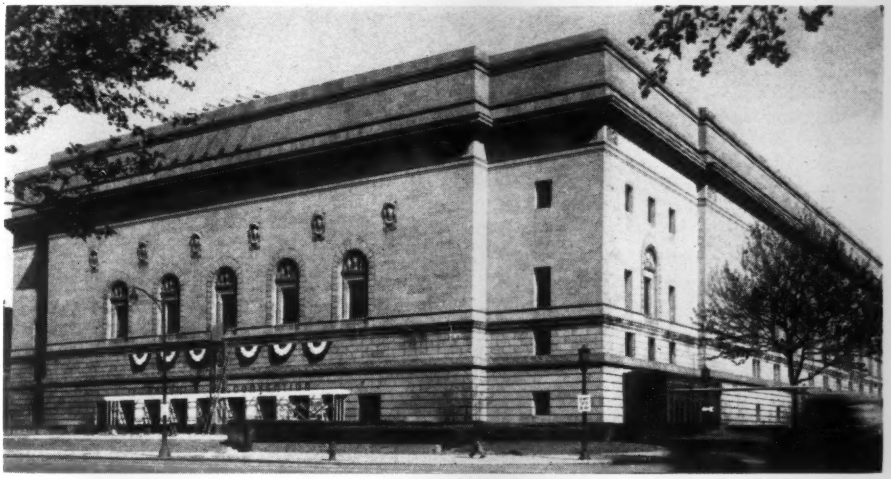


1250 Ton System Conditions



Cleveland's Auditorium

Three centrifugal compressors of 600, 400, and 250 ton capacities are adequate to serve other areas in addition to the 10,000 seat arena and the 3000 seat music hall which mark the first step to complete air conditioning

BY VINCENT EATON
Consulting Engineer

THE CLEVELAND public auditorium recently completed the first step of its air conditioning program by providing year 'round comfort for its main convention and show areas.

Located in the heart of the city, the auditorium has facilities for a multitude of activities. It includes: an exhibit space of over 250,000 sq ft; the main arena, built in 1922, seating over 10,000 people; a large theater

MUSIC HALL, redecorated at great expense shortly before air conditioning was installed, required major changes in the existing method of air delivery. Two existing air supply systems, each of 30,000 cfm capacity, in the space under the balcony, were revamped. Air is supplied through ceiling outlets and through outlets integrated with lighting fixtures under the balcony. Air is exhausted through intakes in the ceilings at the rear above and below the balcony

MAIN ARENA had four independent ventilating systems — with supply and exhaust fans, tempering coils, air washer, and reheat coils — in the four corners of the attic space. Specially designed aluminum air supply diffusers replaced the 16 old plaster ceiling air supply outlets, and chilled water coils replaced the air washers. Exhaust and recirculating air intake grilles are in the balcony face and in the ceilings above and below the balcony

or music hall, built in 1928 and seating 3000; a little theater seating 678; a large ball room, and several club rooms and halls.

A $600,000 bond issue provided for this initial program of air conditioning. The installation is designed for future expansion to serve other areas without requiring any additional central refrigeration equipment.

Since a multitude of events had been booked for a year in advance, the basic design necessitated keeping the alterations in the occupied areas to a minimum and carefully scheduling activities during construction.

Major problems included allocation of space for the refrigeration equipment and maximum utilization of the existing ventilating systems.

Three centrifugal compressors of 600, 400, and 250 ton capacities are installed in the machinery room. The temperature of the chilled water ranges from 42 to 50 F, and that of the condensing water ranges from 85 to 95 F.

Also in the machinery room are the circulating pumps, a large storage and expansion tank, the cooling tower pumps, and the control center.

Since this area is completely below grade and without windows, special provision had to be made for ventilation and heat removal. Acoustical treatment of the walls and ceilings was essential also, since the adjoining areas are used for exhibits, and the machinery room is directly below the lobby of the music hall.

Motors which drive the compressors have the following specifications: 2300 volt, three phase, 60 cycle, 1770 rpm. The 600 and 400 ton units are equipped with squirrel cage motors. The 250 ton machine is driven by a wound rotor variable speed motor.

Each machine has its own pump which circulates the chilled water from the chiller to the 7000 gal storage tank. Respective pump capacities are 1500, 1000, and 600 gpm. Each of these pumps starts automatically with the starting of the respective refrigeration unit.

Three pumps are used to circulate chilled water between the storage tank and the cooling coils of the different fan systems. The large chilled water storage tank would make it possible to air condition one of the small meeting rooms for several hours with the refrigeration units all shut off.

Any or all three refrigeration units can be used for any service. Separate circulating pumps supply chilled water to the arena and the music hall.

Operating costs for the system during the first year, 1955, are shown in Table I.

Two cooling towers are installed on the roof over the south wing. Since this roof had not been designed to carry such heavy loads, the steel work had to be carefully studied to find locations which met structural requirements and from which the towers would not be objectionably visible from the streets. Towers with minimum height and maximum load distribution helped solve both problems.

The combined capacity of the towers is 4000 gpm. Water is cooled from 95 to 85 F at an outdoor temperature of 75 F wet bulb. The two circulating pumps in the machinery room each have a capacity of 2000 gpm. The operation of the entire water chilling system is automatic. None of the chilling units can start until after the cooling tower pumps are in operation.

Heating Load Light; Cooling Load Heavy

Since the arena and the music hall are almost completely interior areas, except for roofs, the heating load is light except for ventilation air. Low pressure steam is supplied from street mains of the utility company.

The cooling load for the arena totals 12,360,000 Btu per hr, of which people account for 4,800,000 Btu per hr; lights, for 1,500,000 Btu per hr; ventilation air, 4,950,000 Btu per hr; and the building construction, 1,112,000 Btu per hr. The cooling load for the music hall totals 2,880,000 Btu per hr, of which people account for 1,200,000 Btu per hr; lights, 225,000 Btu per hr; ventilation air, 1,014,000 Btu per hr; and the building construction, 205,000 Btu per hr.

Four Fan Systems Serve Main Arena

There are six air supply units, all separately controlled.

TABLE 1—OPERATING COSTS for Cleveland public auditorium air conditioning system serving the arena and music hall totaled $8870.20 for the year 1955

Operation			
Equipment	Hours		Kwhr
250 ton compressor	60		19,260
400 ton compressor	150		75,450
600 ton compressor	60		161,220
Four d-c fans	210		23,385
		Total	279,315
Expense			
Electricity	$5586.30		
Labor			
Electrician	1027.50		
Engineer	1502.80		
Total	$2530.30		
Maintenance			
Cleaning Filters	$ 311.60		
Draining system in fall	221.00		
Putting system back in operation in spring	221.00		
Total	$ 753.60		
		GRAND TOTAL	$8870.20

The original ventilating equipment for the main arena consisted of four independent fan systems installed in the four corners of the attic space. Each system was made up of a supply fan, with tempering coils, air washer, and reheat coils, and an exhaust fan.

Each system has a capacity of 75,000 cfm and can take 100 percent outside air, or 100 percent recirculation air, or any desired combination of each.

The fans for these systems are driven by d-c variable speed motors.

A new a-c electric service and transformer was installed for the new motor driven equipment. This service provides 1100 volts. The compressor motors operate on 440 volts, and the other equipment operates on 220 volts.

In the original system, ventilation air was delivered to the main arena through 8 × 9 ft main air supply ducts via 16 reinforced plaster ceiling outlets, each 4 ft, 6 in. wide × 11 ft, 6 in. long. Exhaust and recirculating air intake grilles were in the balcony ceiling, in the face of the balcony, and under the balcony.

Also in the original system was an elaborate installation of motor operated dampers in the attic space, which made it possible to completely reverse the flow of air. These dampers, although not used now, were not removed because of the expense. Only minor changes were made to improve the system's operating condition, chiefly setting the dampers in position to give the desired air flow.

Use 16 Big Air Diffusers

Adapting these systems to cooling without major changes to the mechanical equipment, extensive alterations to the building, and complete redecorating was a serious problem. The introduction of large volumes of cool air through a small number of large outlets is not the most desirable procedure. However, the fact that the ceiling outlets were about 80 ft above the main floor of the arena gave greater possibility of diffusion and mixing without creating drafts, provided a satisfactory type of ceiling outlet could be found.

Specially designed diffusers were required, consisting of a frame constructed of aluminum angles and channels into which were laid 12 sets of directional vanes also of aluminum. Each set of vanes can be lifted out and turned to deliver air in any desired direction. These vanes also form the face of the diffuser.

To install the new diffusers, first the old plaster outlets were cut away, leaving 16 openings in the ceiling, each 4 ft, 6 in. × 11 ft, 6 in. The new aluminum frames were then drawn up by cables from the arena floor and securely fastened in place. The directional vanes were then laid in place in the frame.

Since the existing air washers were worn out and not of a type suitable for cooling, they were removed and chilled water coils were installed. However, the air washer basins were left in place for handling the condensation from the cooling coils.

As space conditions prevented the installation of automatic selfcleaning type filters, high velocity sectional filters were installed, with cleaning provisions in the attic at both north and south ends. An existing attic fan, previously used to exhaust air from the arena in summer, was converted to circulate outdoor air through the attic to remove the heat generated by the lights in the lamp chamber and the sun effect on the uninsulated roof above.

Music Hall Presented More Problems

As is often the case, the smaller of the two projects offered the greatest variety of problems. Major changes were required in the existing method of air delivery. New ducts and diffusers were installed, existing lighting fixtures and air outlets were redesigned, and diffusing plaques were hung under existing ornamental ceiling outlets to prevent drafts.

Two air supply systems, each having a capacity of 30,000 cfm were located in the space under the balcony. Air is supplied through ceiling outlets and through outlets integrated with lighting fixtures under the balcony. Air is exhausted or recirculated through intakes in the ceiling at the rear of the balcony and in the ceiling under the balcony.

In general, the cooling system is the same type as used for the main arena.

Coordinated Installation with Activities

The most important single consideration during the installation was noninterference with scheduled events. Each month a list of activities was issued by the auditorium management. These schdules were studied by all parties affected. Some events, such as the Metropolitan opera, called for stoppage of all installation work during that week. Other types of functions required curtailing work in different areas or during specific times. Nevertheless, maximum cooperation of all parties concerned made it possible to complete the installation on schedule.

The air conditioning contractor was the Smith and Oby Co.

The project was completed under the supervision of Anthony Gattozzi, city commissioner of architecture, and Paul J. Hurd, the commissioner of auditoriums and stadiums. ∓

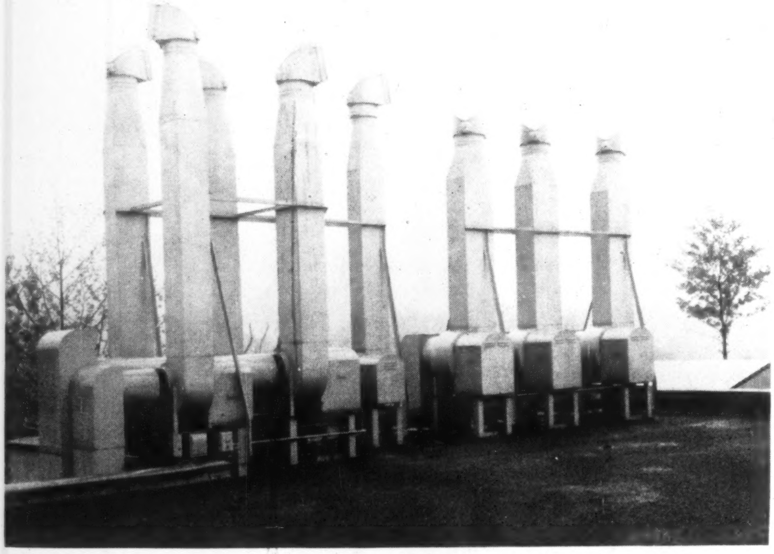
Unusual Looking Blower Installation Protects Lab

. . . against fire, explosion

An unusual looking installation of centrifugal fans at the Gulf Research Center, Harmarville, Pa., exhausts flammable and other harmful vapors from the cleaning room of the new Automotive Products Evaluation Laboratory just completed, according to The Peerless Electric Co.

The cleaning room has four soaking tanks and two spray booths, each equipped with its own fume exhauster. The soaking tanks are filled with solvents for loosening deposits on dirty engine parts after they've been tested. Each tank is fitted with long slots along the fronts and sides, through which vapor laden air is drawn into a duct through the blowers on the roof, and then discharged into the atmosphere with vent stacks 15 ft above the roof.

A static pressure regulator in the supply air duct automatically throttles the air intake damper on the supply fan to provide tempered air in the correct quantity required in accordance with the number of blowers in operation.



CENTRIFUGAL FANS with vent stacks 15 ft above roof exhaust flammable and other harmful vapors from new auto products testing lab

The system is designed to provide maximum protection from fires and explosions. An extensive fire protection system automatically sounds a warning to personnel, shuts off all supply and exhaust blowers, and fills the room with carbon dioxide gas to starve any fire caused by a rise in temperature at any one of the heat sensing elements in the room.

The complete blower and duct work system was installed by Morgan Bros. Co. for Langdon-Kaschub, heating and ventilating contractor. ∓

HOT SPRINGS REGION near Reykir is one of two main sources. Temperature of some borings is as high as 210 F. The deepest well is 2500 ft, the average being 1100 ft. Water flows from wells under its own pressure into small reservoirs, from which it is pumped into the conduit system

Natural Hot Springs Heat Iceland

. . . via district heating system serving five cities and towns

Hotels, schools, hospitals, greenhouses, and other structures are heated by hot water — averaging 140 F in temperature — distributed by two 14 in. steel pipe lines laid parallel in a unit conduit above ground.

BY WILLIAM J. WHATLEY
Mechanical Engineer
Patchen and Zimmerman,
Consulting Engineers

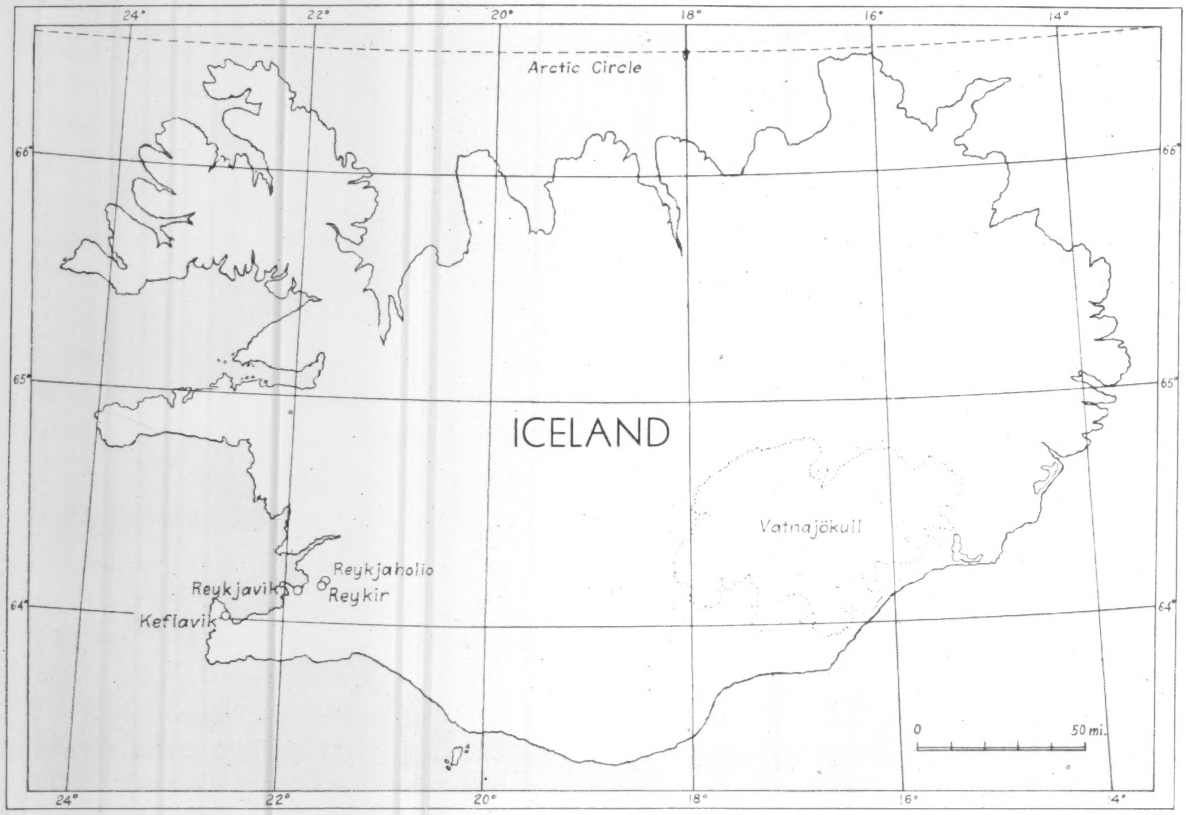
THE ACTIVITY of natural hot springs in Iceland is more intense and spread over a wider area than anywhere else in the world.

Since early times these springs have been used for bathing and washing, and even for baptism. In recent years, however, these springs have been used for heating hotels, schools, hospitals, and greenhouses, as well as for other purposes. Serving five towns and cities is a modern district heating system which utilizes a remarkable system of surface and underground conduit.

The largest and oldest system of all is owned by the capital city of Reykjavik. The first part of this system was completed in 1930. The main part of the system, however, was built during World War II. Since then, it has been extended over 50 percent. Today, some 3500 buildings in the capital are served with natural hot water for heating and domestic water services.

Tap Two Main Sources

Hot water is supplied mainly from two places: Reykir, about 11 mi distant, and Reykjahlio, 2 mi further out. In spite of the many natural hot springs on the system, the total amount of water supplied was not enough to meet the increasing re-



ICELAND is sparsely populated — about four persons per square mile — and the places of habitation hug the coast. The island boasts almost every kind of hot spring, including alkaline, acid, and sulfurous. Water used for heating is so clean that it is pumped directly into the distribution system without treatment

Hot Springs Gush from Land of Volcanoes

Iceland is a large — 39,750 sq mi, or slightly smaller than Kentucky — island in the North Atlantic ocean close to the Arctic circle. Its climate is modified by the Gulf Stream. About 800 mi northwest of Scotland, it is an important stop on the Great Circle Route. Keflavik international airport is 16 to 18 hr from New York.

Iceland is roughly oval in shape, with a large peninsula known as the Western Fjords projecting to the Northwest. The largest extent of low ground is in the Southwest, but more than 80 percent of the island is a plateau 2000 to 3000 ft above sea level. Much of it is a desert of lava, with no inhabitants. Otherwise this area is volcanic dust or sand, glaciers, smoldering volcanoes, and gushing hot springs. In the Southeast is Vatnajokull, the most extensive ice field in Europe, with an area of over 3000 sq mi.

Only one-seventh of the land is productive. Imported are coal, oil, and timber. Occupations are mainly fishing and agriculture, but industry is growing. The largest plant is a $7 million modern ammonium nitrate plant completed in 1954.

There are good natural harbors on the West, North and East coasts. There are no railways, but roads are fairly well developed, as is the system of Icelandic Airways.

The U.S. is completing a large naval air establishment at Reykjavik, which is also an international airport in its own right.

Politically, Iceland has been an independent republic since 1944. It has the oldest parliamentary assembly in the world—over 1000 years old. The country has no army, navy, or forts.

The capital of Iceland is Reykjavik, with a population of about 60,000. The total population of the country is about 150,000.

quirements for Reykjavik. So additional deep wells were drilled.

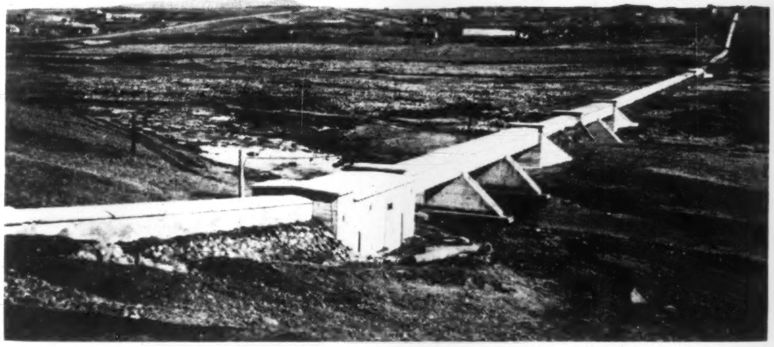
Formerly the hottest wells had a temperature of 180 F, but one of the new borings has developed a temperature of 210 F, and the average temperature of all borings is 189 F.

The yield of hot water from these two sources is now nearly 6675 gpm. At Reykir, there are 46 wells, and near Reykjaholio there are 25 borings completed, with 16 of them nearer to the town.

The diameter of these bored wells varies from 4 to 8 in. The average depth is 1100 ft, with the deepest being about 2500 ft.

Pump Water to Storage Tanks

Hot water flows from these wells by its own pressure into small insulated cisterns or reservoirs. From the reservoirs, it is pumped directly into



MAIN LINE CONDUIT crosses a river outside Reykjavik, the capital, near the end of its winding course across the bleak landscape

the conduit system, where it is carried into the towns. From the most remote station at Reykjaholio the water is pumped 2 mi through a 10 in. pipe to Reykir, over a ridge. At Reykir water from both areas is gathered and stored in insulated tanks. The pumping station from Reykjaholio has two electrical pumping units, partly automatic and partly remote controlled from Reykir.

The main pumping station at Reykir has three electrical pumping units, each served by a 300 hp motor. Each pump handles 2500 gpm, against a head of about 200 psig. A reserve, or standby station is available, equipped with a 1050 hp diesel engine and an 860 kw generator.

Hot water is pumped from this main station at Reykir to Reykjavik a distance of 9.5 mi. This main line pipe lines, laid parallel in a unit system consists of two 14 in. steel conduit. This conduit is all above ground, except where road crossings are made. Many of the ravines are crossed by field stone culverts, which support the conduit from the ground. These are elevated and have round or elliptical openings through them for surface water passages. Stream crossings, ravines, and crevices are all crossed by this type of masonry support, and they are all very ingeniously made. The main line varies from the right to the left of the road, and winds in and out over the bleak landscape.

Temperature Drops Only 5 F

The exterior of the conduit is all precast concrete, with the bottom, sides, and top cast as separate units, and assembled and completed as a unit system for both the 14 in. pipe lines. These lines are insulated with a special kind of native turf mat. Total temperature drop from the mains during the coldest time of the year is only about 5 F.

Eight main storage tanks for the system are on a hillside just outside the capital. Their total volume is 250,000 gal, which is about one-fourth of the maximum daily requirements.

The tanks serve to equalize the flow throughout the day, and to equalize the pressure. From the tanks, the hot water flows by gravity to the distribution lines system in the city.

Occasionally, however, the demand is greater than the available supply, and a booster pumping station is put into service. It is just below the storage tanks and can increase the service system by about 30 psig. It is automatically controlled by a manometer in the town system of distribution mains. The total length of street conduit mains is 27½ mi, and the sizes vary from 18 in. to 1 in. diam. Connections are made from the street mains, and vary in size from 2½ to ¾ in. diam. The total length of these connections is about 17½ mi.

The street mains inside the city are insulated with porous lava slags, also in the same precast construction of concrete, as the main supply. Connections are insulated with glass wool, and all lines are installed in precast concrete construction, with the exception of part of the construction. From the storage tanks to the most remote connection on the system, the heat loss is somewhat greater on account of lower velocity and volume consumed; however, the average temperature in the town system is 135 F to 144 F, in the heating season.

In addition to the necessary insulation used, the lines have adequate provision for contraction and expansion in well placed expansion joints and anchor points.

At Reykjavik the annual average outdoor temperature is 39 F, with the average temperature in January being 30 F, and in July, 52 F.

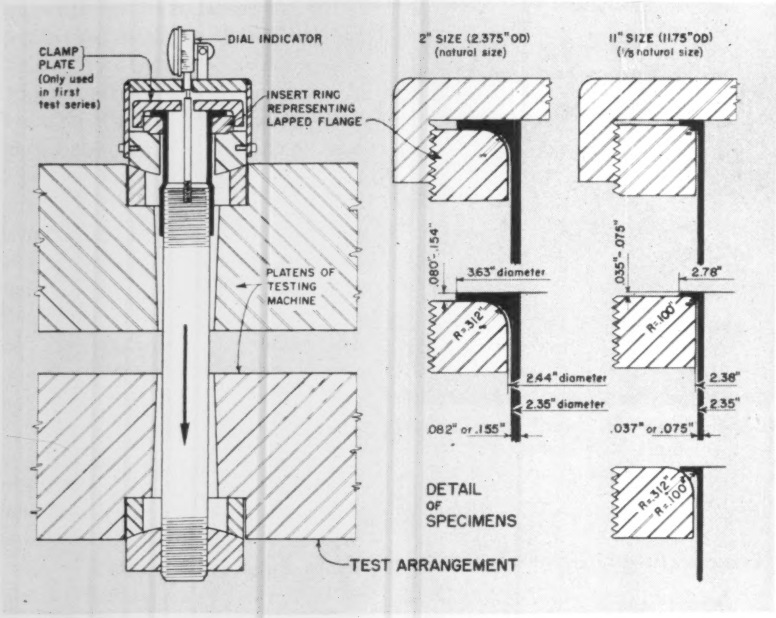
System Proves Profitable

The water from the hot wells is so clean that it can be piped directly into the system for heating and for domestic water. After the heat has been removed, water leaves the buildings as waste through the regular drainage system. Domestic water is metered and sold to each customer for $0.19 per cubic meter.

The total cost of this district system to date is approximately $2.8 million. The total income is now approximately $1.2 million per yr. Of this income, about $550,000 is used for working capital and operating expenses, maintenance, and the cost of further deep well drilling.

Reykjavik's district heating system is of vast economic and social importance, not only for the city, but the nation as a whole. Each year it saves importing more than 50,000 tons of coal.

The system is also a source of steady income and provides the citizens with an economical and convenient heating medium, as well as domestic hot water. It helps to keep the city free from smoke, dust, and ashes, and thereby contributes greatly to the public health. ⌗



LAP JOINT STUB ENDS in tests were mounted in lap joint flanges and were then pulled by the application of an axial force under various constraint variations. The overall elongation of the lap joint stub end was plotted against the applied load. The intercepts for 5 percent offset were read from this load-elongation plot and converted to values of longitudinal stress in the pipe. Because of space limitations, illustration has been reduced to one-half original size

How to Figure Pipe Lap Thickness

. . . for lap joint stub ends of two recently developed light schedules, 5S and 10S. A new formula given here is supported by experimental tests and analytical comparisons.

BY A. R. C. MARKL
Product Engineering and Research
Tube Turns
Div. of National Cylinder Gas Co.

NO SATISFACTORY method of calculating lap thicknesses for lap joint stub ends having yet been devised, it has remained standard practice to make these equal to the pipe wall. This rule has worked well for the traditional pipe weights, but cannot be expected to provide sufficient lap thickness for the more recently developed light schedules, specifically 5S and 10S established in American Standard B36.19.

For these, the following proportioning formulas have been derived on the basis of a comparative analysis supported by confirmatory tests:

Schedule 10S:

$$L_{10S} = \sqrt{T_{10S} \times T_{40}} \quad \text{........} \quad [1]$$

Schedule 5S:

$$L_{5S} = \sqrt{T_{5S} \times T_{40}} \quad \text{.........} \quad [2]$$

where L = minimum lap thickness, and T = nominal pipe wall thickness; the subscripts identify the pipe schedule number.

Because of the indeterminacy of the loading and the restraint conditions, a direct computation of the lap thickness on the basis of given allowable stresses is not practical. Instead, calculations and tests have been so conducted as to determine what lap thicknesses in the lighter schedules produce the same controlling or elastic failure stresses as are present in Schedule 40 laps if the longitudinal stresses in the attached pipe are equal.

This entire study refers only to lap joint stub ends with fillet radii conforming to the dimensions established in American Standard B16.9, when used with lapped pipe flanges conforming to American Standard B16.5.

From the standpoint of mathematical analysis, a lap joint stub end can be considered to be similar to a flange with a full-face gasket. While we are able to compute stresses in flanges where the gasket is wholly contained within the bolt circle, no fully satisfactory method has yet been advanced for flanges where countermoments are introduced by gasket reactions outside the bolt circle. For this case, conditions are quite complex, a proper analysis requiring the evaluation of the deformations of all components of the flanged joint, i.e. the flange, the bolts, and the gasket; moreover, clearances, parallelity of faces, and other accidental variations may be expected to affect performance significantly.

While it is not possible to calculate lap thicknesses directly, it appears permissible to use current flange calculation methods for comparing essentially similar designs, and this will be done later.

In comparing two piping assemblies of equal size, but different pipe wall thickness, it is evident that the total hydrostatic end loads will be proportional to the pipe wall thicknesses if the longitudinal stresses — from pressure or axial loads — are equal.

If the outside diameters of the

laps are the same, the gasket loads will be substantially identical for any one type of gasket, since the difference between the bores of Schedule 40 and Schedules 5S and 10S is minor. As it is, the gasket loads need not be considered since they are for the most part taken up in direct compression and do not contribute significantly to the moments acting at the points of critical stress where the fillet radius fades into the neck and into the lap of the stub end.

Accordingly, the hydrostatic end load alone need be considered in computing the internal bending moment acting on the stub end as a whole. While its lever arm cannot be reliably evaluated, it can be established in general terms as equal to the sum of:

1) One-half the wall thickness.

2) The fillet radius.

3) The clearance between the flange bore and the stub neck OD.

4) An additional distance to develop bearing between the flange and lap faces.

All components of the lever arm, except item (1), are or may be assumed constant, so that it will be conservative — for the evaluation of Schedules 5S and 10S lap thicknesses from Schedule 40 — to assume the entire lever arm as constant. With this assumption, the applied moment becomes proportional to the hydrostatic end force and hence to the pipe wall thickness.

Using a moment cT_{40}, where c is an unknown proportionality constant, in the stress analysis of a Schedule 40 lap according to the Rules for Bolted Flanged Connections of the Boiler and Pressure Vessel Code, a specific value is computed for the controlling flange stress. Using a moment cT_{10S}, where c is the same constant as before, in a parallel analysis of a Schedule 10S lap, for example, it is obvious that the controlling stress can be made to attain the same value as found for the Schedule 40 lap by selecting a suitable lap thickness L_{10S}. This has been done for all pipe sizes in Schedules 10S and 5S on the assumption that the fillet can be replaced by a 45 deg triangle of equal cross-sectional area; the resulting lap thicknesses are given in Columns 4 and 7 of Table 1.

These values are almost identical to those computed from Equations 1 and 2, as a comparison of Columns 4 and 5, and 7 and 8 reveals. This serves to confirm the adequacy of these formulas and indicates that an even simpler analysis could have been used, as follows:

1) Let the hydrostatic end force per unit circumference again be taken proportional to the specific pipe wall thickness involved; designate this as T_x.

2) Again assume the lever arm to be constant, expressed as T_{40} multiplied by a proportionality factor.

3) The applied moment then is proportional to T_xT_{40}.

4) The resistance of a lap of thickness L_x, taken as a cantilever beam of unit width, is measured by its section modulus, which is proportional to the square of the lap thickness, or L_x^2.

5) Hence, to give equal stress — moment divided by section modulus — the lap thickness must be made $L_x = \sqrt{T_xT_{40}}$.

Pull-out tests were conducted on lap joint stub ends of two sizes in (1) Schedule 40 thickness and (2) a thickness within the range of Schedules 5S and 10S. One series was conducted on the 2 in. diam size (2.375 in. OD) with 0.154 in. and 0.084 in. neck thickness; the second on one-fifth scale models of 11.75 in. OD pipe (11.75/5 = 2.375 in.) with 0.377 in. and 0.185 in. thickness. The lap thickness of the lightweight specimens was varied between values equal to the lightweight pipe thickness and the Schedule 40 pipe thickness.

The test specimens were mounted in lap joint flanges as shown on page 102, these being either full scale — 2 in. size — or scaled down (11.75 in. OD). They were then pulled by the application of an axial force under various constraints:

1) Face of lap constrained by plate screwed down hand tight over it (regular flange).

2) Face of lap unconstrained (regular flange).

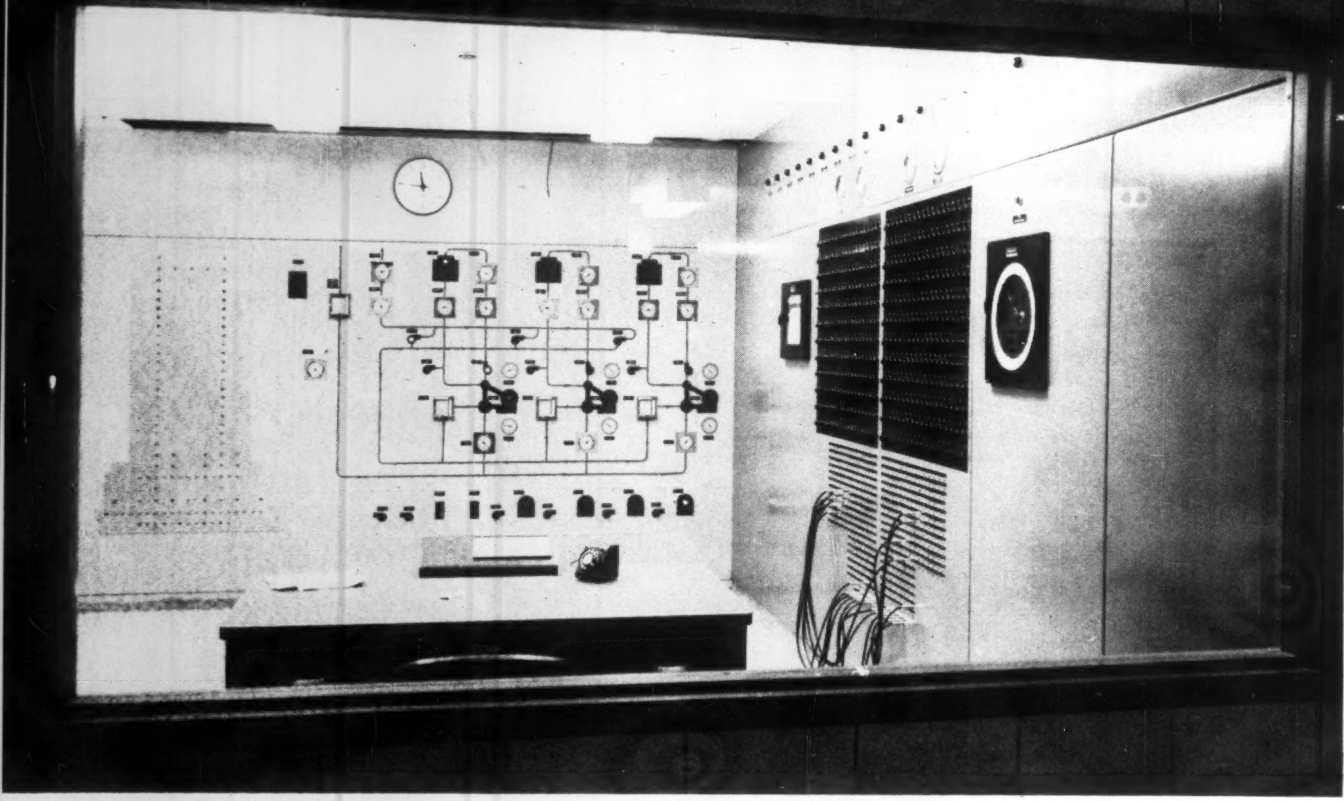
3) Face of lap unconstrained, but flange with larger fillet radius used so that lap was supported at extreme outer edge (this condition was used for the 11.75 in. size only, being produced by using the 2 in. flange in place of the scaled down 11.75 in. flange).

The overall elongation of the lap joint stub end was plotted against the applied load and the intercepts for 5 percent offset were read from this load-elongation plot and converted to values of longitudinal stress in the pipe.

The lightweight stub ends with lap thicknesses computed from the formula $L_x = \sqrt{T_xT_{40}}$ were found to yield at the same applied longitudinal stress (within ± 7 percent) as the standard Schedule 40 stub ends under all conditions. ‡

TABLE 1—PIPE LAP THICKNESSES computed from the proposed formula are almost identical to those resulting from comparative analysis, using current flange calculation methods for comparing essentially similar designs

	Schedule 40	Schedule 10S			Schedule 5S		
			Min lap thickness, in.			Min lap thickness, in.	
Diameter, in.	Pipe wall = min lap thickness, in. $T_{40} = L_{40}$	Pipe wall thickness, in. T_{10S}	by comparative analysis	$\sqrt{T_{40}T_{10S}} = L_{10S}$	Pipe wall thickness, in. T_{5S}	by comparative analysis	$\sqrt{T_{40}T_{5S}} = L_{5S}$
1	2	3	4	5	6	7	8
½	0.109	0.083	0.093	0.095			
¾	0.113	0.083	0.095	0.097	0.065	0.082	0.086
1	0.133	0.109	0.120	0.120	0.065	0.090	0.093
1¼	0.140	0.109	0.122	0.124	0.065	0.093	0.095
1½	0.145	0.109	0.125	0.126	0.065	0.095	0.097
2	0.154	0.109	0.127	0.130	0.065	0.098	0.100
2½	0.203	0.120	0.153	0.156	0.083	0.125	0.130
3	0.216	0.120	0.158	0.161	0.083	0.130	0.134
3½	0.226	0.120	0.162	0.165	0.083	0.135	0.137
4	0.237	0.120	0.166	0.169	0.083	0.140	0.140
5	0.258	0.134	0.180	0.186	0.109	0.165	0.168
6	0.280	0.134	0.192	0.194	0.109	0.178	0.175
8	0.322	0.148	0.215	0.218	0.109	0.193	0.187
10	0.165	0.165	0.246	0.245	0.134	0.232	0.221
12	0.375	0.180	0.269	0.260	0.165	0.259	0.249



MASTER CONTROL CENTER, with colorgraphic panel and building silhouette, left, and over 400 preset and check points, right, electronically controls and checks all major mechanical equipment components that . . .

Air Condition Bank of The Southwest

A single operator maintains complete control of the 3000 ton air conditioning system in this 24 story bank-office building in Houston. Conditioned air is distributed to 400 zones at low pressure by both interior and perimeter systems.

BY GUY FURGIUELE
Associate
H. E. Bovay, Jr.
Consulting Engineers

Design of a large office building is always a challenge to the engineer's imagination. No exception was the Bank of The Southwest building in Houston. This is one of the largest buildings in the South and Southwest — 825,000 sq ft. Even when the engineering had just started, it became obvious that the air conditioning requirements would be much larger than for any other buildings in the area.

Bank Occupies Lower Floors Only

The Bank of The Southwest has a subbasement one block long and about half a block wide, or 250 ft long and 125 ft wide. In this subbasement are the bank vaults, the employees' magazine offices and darkroom, the print shop, and service department, and the major mechanical equipment.

The basement above this is a full block square, 250 ft by 250 ft. In this area are concourses from tunnels to the Ten Ten parking garage and to the Commerce building. The concourses are lined with retail stores and specialty shops. Also on this level are the cash vault, the upper level of mechanical equipment, the consumer credit department, and the equipment master control center.

From the street level up, the bank proper occupies four stories one block square. The street floor contains shops, stores, the entrance lobby, and in one corner the drive-in bank.

From the concourses rise the escalators which lead to the main banking floor on the first level above the street. The third level above the street is also occupied by the bank and contains additional departments.

The fourth level will eventually be used by the bank, but at the present time this is being used as rental space.

Starting at the fifth level, a 20 story tower rises to complete the 24 floors of the bank above the street. This tower level is one block in width and about half a block thick, and has about 23,000 sq ft on each floor. The tower portion is rental space. It rises 368 ft above the ground and is sheathed with aluminum.

The tower and the main banking portions of the building are completely separate for operation and control. Controls are designed so that the first four floors of the bank may be completely shut down and removed from use, and the equipment can still serve the tower, or vice versa. Actually the top 20 floors are owned by the Tower Corp. who obtained air rights from the Bank of The Southwest, while the lower portion is owned by the bank.

System Has Three Compressors, Four Boilers

The major equipment in the bank includes three 1000 ton centrifugal compressors driven by electric motors coupled to the compressors with a fluid drive control. This fluid drive is controlled by water temperature leaving the chillers.

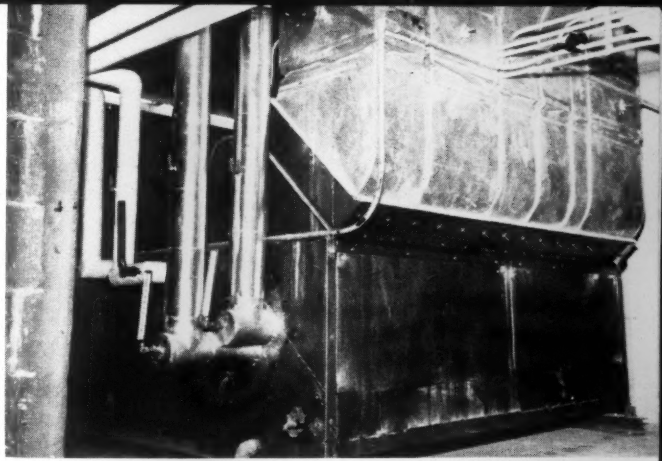
There are three chilled water pumps, each pumping 3000 gpm. Each of these pumps is coupled with a fluid drive to its electric motor and the fluid drive is controlled by a pressure controller which maintains constant pressure in the chilled water distribution piping.

There are three condenser water pumps, each pumping 3000 gpm. Four low pressure steam boilers generate steam at 15 psig and produce 7500 lb of steam per hr each.

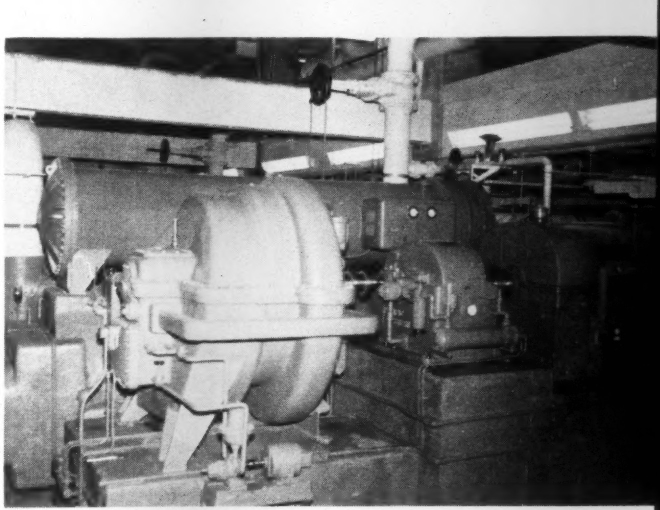
Converters in each mechanical room throughout the building convert this steam to hot water, which is then used in the coils for the air handling units. The hot water temperature is electronically preset in accordance with outside air temperatures.

There are two air handling units on each of the tower floors. Each of these units is of the multizone type and serves six zones, making a total of 12 zones per floor.

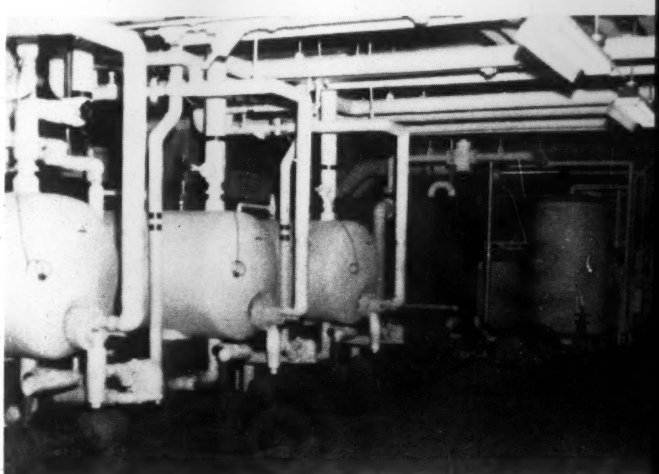
The original design was laid out so it would be economical to air condition half of any floor without air conditioning the remainder of that floor or any other floor. In actual practice, it has turned out that during certain



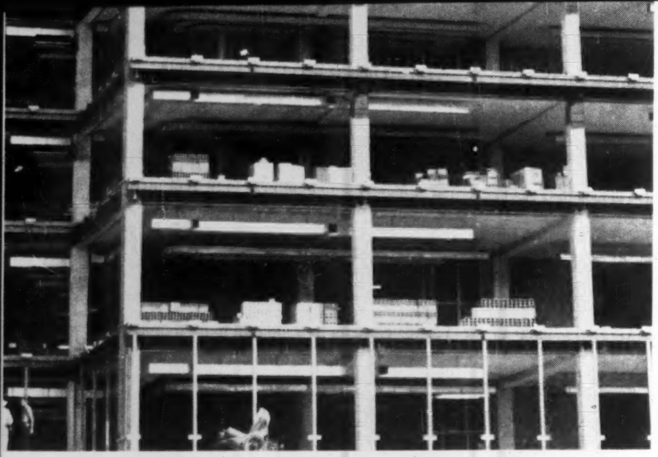
MULTIZONE AIR HANDLING UNIT is one of 40 serving the 20 tower floors. Two way modulating control valves maintain constant leaving chilled water temperature from each



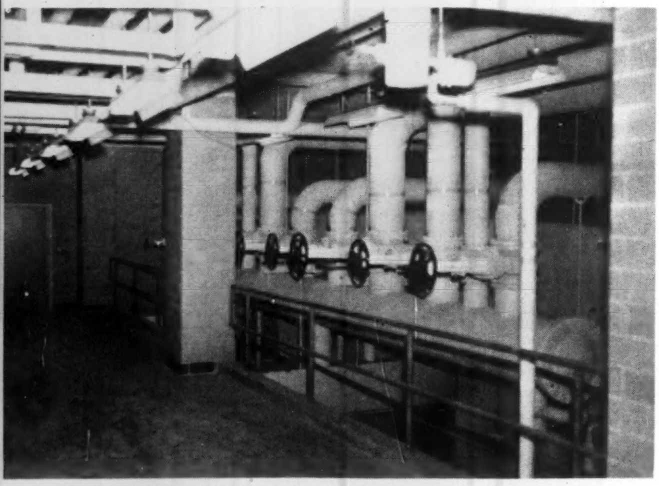
1000 TON WATER CHILLER — one of three — utilizes a fluid drive coupling to maintain an accurate leaving chilled water temperature



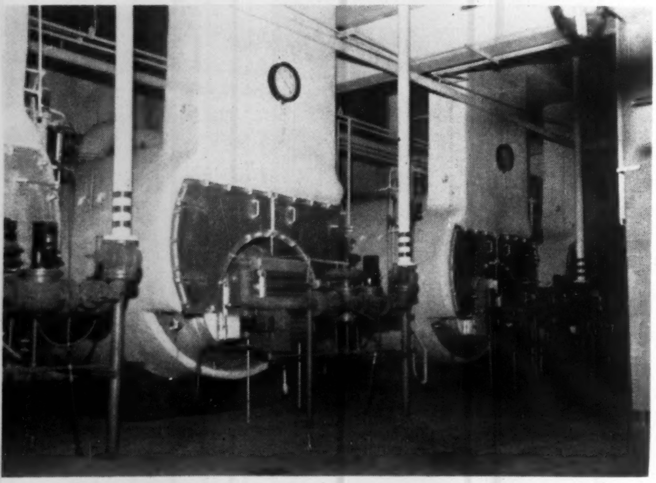
HOT WATER STORAGE generators are compactly arranged. Beyond them are condenser water injection pumps and water softeners



DUPLICATE DUCTWORK for perimeter air distribution on 5th through 24th floors saved money yet permitted complete flexibility in the system



MAIN STEAM HEADER has all steam valves easily accessible from upper level of the major mechanical equipment room of the bank



LOW PRESSURE BOILERS — four in all — capable of a total 30,000 lb of steam per hr generate steam at 15 psig. They are installed in the subbasement

times of the year the air conditioning can be left on all night economically.

Forty air handling units also serve the four floors below the tower. Some of them are single zone units, and some are multizone units based on zoning requirements.

Duct System Flexible to Meet Tenant Changes

Air distribution is accomplished by a low pressure system through galvanized sheet metal ductwork which is lined internally with glass fiber insulation. This was chosen because it is a thermal-acoustic insulator.

Considerable thought was given in the first layouts to the main internal branch ductwork and its location. As a result, the system is so designed that as tenants move into the building, regardless of the layouts of their spaces, it is possible to serve them by minor relocation of boots in the main branch ductwork to provide for takeoffs to any tenant's space. This will not only save money through the years as tenants' requirements change, but it saved the bank considerable first cost since they were able to take bids on a complete system in the beginning rather than add extras as tenants began to lease.

In addition to the main internal distribution system on each floor, a perimeter distribution system of the low pressure type is installed, with the diffusers in stools under the windows.

Again, advantage was taken of standardized designs and the complete flexibility provided in this system, so that every floor was duplicated for the sheet metal work required for this perimeter system. Therefore, once the fifth floor equipment was installed, this could serve as a jig. This again saved money in the construction of the building.

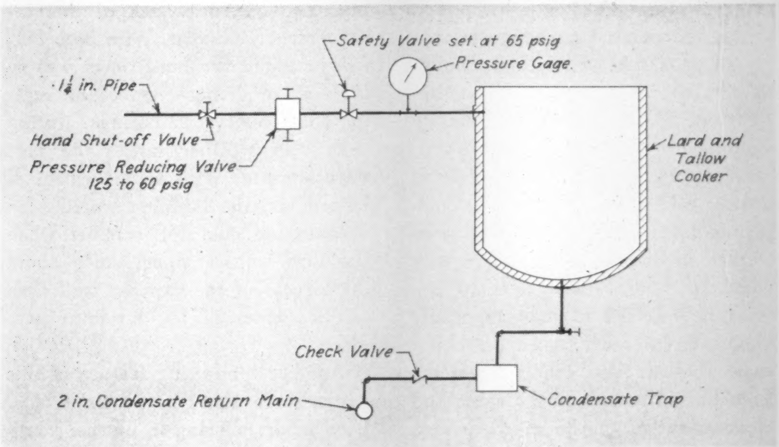
Manual Volume Control Permits Adjustments

Some degree of control is provided in this perimeter ductwork by manual volume control. This gives the tenants a limited adjustment and makes them physically and psychologically happier with their systems.

The system was designed for 75 F dry bulb and 50 percent relative humidity inside, with 95 F DB and 80 F WB outside. Fortunately the system has proven flexible enough so that certain of the tenants who seem to desire an inside temperature of 72 F or lower can have it.

An electronic control system maintains uniform temperatures throughout the building. A monitoring control system in the basement keeps a check on and controls approximately 400 temperature zones in the building. With this monitoring service, which utilizes an electronic telephone dial system, a single operator can maintain complete control of the entire heating and cooling system. Any of the 400 temperature zones can be remotely preset to meet the occupants' requirements. From this control center, it is also possible to start and stop any one of the many air handling units and exhaust fans.

The heating, piping, and air conditioning contractor was Straus-Frank, Inc. +


Safety Valve set at 65 psig
Pressure Gage
1¼ in. Pipe
Hand Shut-off Valve
Pressure Reducing Valve 125 to 60 psig
Lard and Tallow Cooker
Check Valve
2 in. Condensate Return Main
Condensate Trap

How 10 Cases of Wrong Design Were Corrected

Modern heating, piping, and air conditioning systems, for efficient and satisfactory operation, must be correctly designed. Here are 10 typical cases from the author's experience where original design was faulty and had to be corrected.

BY C. T. BAKER
Consulting Engineer

Case No. 1

A PACKING HOUSE processed several hundred cattle and about the same number of hogs each month. Before being placed on the de-hairing machine, the hogs were scalded in a large rectangular steel tank, called a scalding vat. Steam at boiler pressure was introduced through perforated pipes fastened to the bottom of the tank.

A 1¼ in. steam pipe connected the steam supply and the water heating coils, and the steam supply to the coils was controlled by a 1¼ in. hand stop valve. It was not unusual for workmen to forget to close this valve at the end of a kill period which meant that the valve remained open all night until killing time next day. A lot of fuel was wasted by steam flowing into the water heating coil at 125 psig all during the night.

Installation of a ¾ in. thermostatically controlled modulating valve in the 1¼ in. steam supply line maintained the water temperature at the desired point and stopped the waste of steam and fuel.

Case No. 2

IN THE SAME PLANT were installed a 30 in. diameter × 26 in. high beef tallow cooker and a 31 in. diameter × 31 in. high lard cooker. Each was a jacketed vessel using steam at 125 psig, and neither cooker was equipped with a safety valve. At one time the beef tallow cooker had been equipped with a spring loaded safety valve, connected midway of the depth of the vessel, but it had been removed to permit installation of a condensate drain trap. The jacket, of course, could not drain below this point, and consequently the kettle could not heat.

This condition was corrected as shown above, fully protected against steam pressures in excess of those for which they were designed, i.e. 60 psig.

Case No. 3

A RECENT investigation of a low pressure steam heating system serving two of several buildings in a group brought to light many interesting facts.

The boiler room is in a brick lined pit, the floor being 12 ft below grade. Waterproofing the walls, not considered during construction, has proved to be a serious "oversight." In rainy weather, water stands about 6 in. deep on the concrete floor.

A hydraulic jet ejector installed to pump the water out was of little value and handled only a small part of the leakage into the boiler room.

The boiler is hand fired. It is rated at 40 hp.

At the time the plant was built, a pump and collecting receiver were installed. All condensate from the two buildings was collected in a receiver from where it was pumped to the boiler under automatic control.

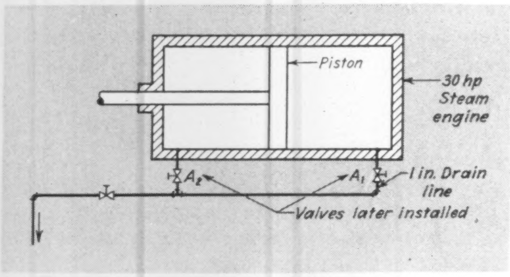
Some years later the pump was removed, and provision was made to dump the hot condensate into the sewer. The idea worked fine, since it was very easy to connect the city water line to the boiler water level control. This not only simplified things but insured an adequate supply of good cold water to the boiler at all times. Of course, the fuel bill went up, but operations were greatly simplified.

Generally, all efforts to hold steam during coldest weather failed. Complaints from the many persons who worked in these buildings were very common. It has been next to impossible to keep a fireman, especially during wet weather, when the boiler room flooded. Also, the fact that the fireman had to tote all the ashes and clinkers out of the boiler room in a large ash can has done much to discourage anyone who undertook the job.

One of the buildings served by the boiler plant in the ground was a 320 seat auditorium. A combination steam coil and fan on each side of the stage out of view supplied the heating requirements for the building. The one drawback of this arrangement was noise. With both fans in operation, the noise level was so high as to actually defeat attempts to hold public gatherings during very cold weather unless the fans were stopped. With no movement of heated air, the building would soon become too cold for comfort when the fans were stopped, since about 30 percent of the exposed wall area on two sides of the structure was glass.

Another interesting feature of this system was that no provision had been made to bring in outside ventilating air. Neither was any part of the heated air circulated by the fans filtered to remove dirt and dust.

The building was practically useless during the winter months, so plans are being developed to correct the many shortcomings of the heating system and to provide ventilation by introducing adequate outside air.



Case No. 4

A 30 HP PISTON VALVE steam engine failed to deliver full capacity, and, too, speed regulation was bad.

The pipe fitter who installed the steam and exhaust piping to the engine also connected up the cylinder drains as shown above. Steam blew from one end of the cylinder to the other. The faulty drain connection also explains the loss in power and poor speed regulation. The trouble disappeared after a valve was installed on each drain outlet near the cylinder.

Case No. 5

A TOTAL of six large steam jacketed cookers were installed in the kitchen of a large institution which serves meals to some 2000 persons. The kettles were divided three to a group, and a common condensate line connected the outlet of each to one trap; that is, the trap was intended to drain all three kettles, one of which was about 8 in. higher than the others. The kettles failed to heat as they should, so it took a much greater length of time to cook a batch of food than was warranted.

The kettles had been hooked up just as designed, but the arrangement is being changed so each will have its own trap.

Case No. 6

THE SAME institution operated its own laundry which consisted of the usual machinery and equipment. Complaint was made that the multiroll ironer never heated enough to ensure rated output. Examination of the hook-up showed that all of the several rolls of this ironer were being drained by one trap. The steam chest of each roll was connected to a common header with the pipe extended some 10 ft to the building wall and joined to an obsolete type of condensate trap. This sort of hook-up made it physically impossible to uniformly heat the rolls. A separate trap is now being connected to each steam chest.

Other equipment consisted of six clothes presses, all of which were connected to a common condensate header, which in turn was connected to a small condensate trap. Here, too, trouble was experienced because of improper heating. The individual presses are now being equipped with separate traps.

Case No. 7

Two 150 hp HRT boilers designed for 150 psig working pressure served a plant where an unexpected series of events occurred. A horizontal double acting compressor driven by a simple expansion Corliss engine furnished refrigeration for a 20,000 bbl per year brewery and a 25 ton distilled water ice tank. A 40 hp piston valve engine supplied power.

A small steam driven air compressor supplied compressed air to the bottling plant where bottled beer was processed. The compressor was in the engine room next to the division wall between the ice storage room and engine room. The air compressor suction pipe extended from the compressor to the ice storage room. The idea back of this air supply was greater capacity and colder air for the bottling department.

While this scheme may have had merit in some respects, the overall effect on plant economy was bad.

One morning the day engineer, coming on duty at 6 a.m., detected a strong odor of ammonia in the ice storage room. Since the cooling of this room was by brine circulation, it was evident that the ammonia must be coming from the ice stored during the night.

The air compressor suction line was removed from the storage room before work started in the bottling department so as to protect against contamination of the beer.

A fore cooling tank fitted with an ammonia cooling coil precooled the distilled water before delivery to the ice cans. Naturally, it was concluded that a leak in this coil was responsible for the ammonia in the ice.

The coil was tested at 125 psig ammonia pressure and found tight. After evacuating the coil of ammonia, the coil was subjected to 250 psig air pressure and found free of leaks.

How did ammonia get into the ice?

The source of the trouble was traced to the boiler feedwater.

The jacket of the horizontal ammonia compressor was cooled by city water. After circulation through the jacket, the water was delivered to an elevated tank above the open type feed water heater from where it was admitted to the heater through a modulating valve on the makeup water line.

It appeared that the contamination of the feed water must stem from a leak around the compressor jacket. The water was shut off and the jacket drained. A small cover plate bolted to the top of the jacket was removed.

After a few minutes' operation of the compressor with the jacket free of water, the leak showed up. A defect had developed in the cylinder lining which permitted ammonia to escape from the cylinder directly into the water jacket.

The ammonia escaping to the water, passed to the heater and then to the boiler, finally reaching the distilled water reboiler and ice cans.

It would appear that much of the ammonia should have been driven out of the water at the open type feedwater heater, and while some undoubtedly was, a sufficient quantity reached the boiler to be carried over to the atmospheric steam condenser and later to the reboiler; and finally, there was still enough in the water to contaminate the ice.

The leaking cylinder jacket was repaired, and the runoff from the cooling water went to the sewer.

Later, a well was driven which furnished all water requirements for the entire brewery operation. This eliminated the use of city water. No more trouble was experienced.

Case No. 8

THE OWNER and the engineer were agreed that the solenoid valves furnished with some new evaporators were no good. These valves came from a good family and they had a good background. Their ancestors all came from the right side of the railroad tracks. But, "they were no good, and the buyer had been gypped."

A little time in running down the cause of the trouble disclosed:

a) The valves, four in all, were installed by the purchaser's general utility man, who had a dim knowledge of cause and effect gained by many years association with hand fired heating boilers, slide valve steam engines, and duplex pumps of early vintage.

b) The valves were installed without bypass or pipe line strainer.

c) The large accumulation of sand and dirt that had collected in the liquid line piping previous to erection had not been blown out. Naturally, most of this passed through the magnetic valves before reaching the evaporators.

d) The cutting action of this abrasive material completely ruined the expensive magnetic valves and the thermal expansion valves as well.

Case No. 9

THE FAIR HAIRED BOY was a smooth talker and he had just a glimmer of knowledge concerning the thermodynamics of air. The cocktail lounge owner trustingly said, "All right, I need this place cooled. You say you can provide the equipment necessary to do the job. Go ahead and get the system in operation as early as possible."

Not much later a truck delivered a widely advertised, 5 ton, selfcontained, air cooling unit. It was set in position and connected to a system of ducts that were installed to distribute the conditioned air.

For the first few days, the unit appeared to be the answer to the internal heat problem, but as outdoor temperatures continued to rise with the approach of mid-June, things went from bad to worse. Nothing the seller could do would make the streamlined cooling unit in the rear of the bar produce comfort.

When the actual heat gain for this location was carefully calculated, it was found to fall between 20 and 21 tons.

The owner is disgruntled, as he has every reason to be. Before conditions become satisfactory, he will be compelled to invest several hundred dollars more in equipment and labor.

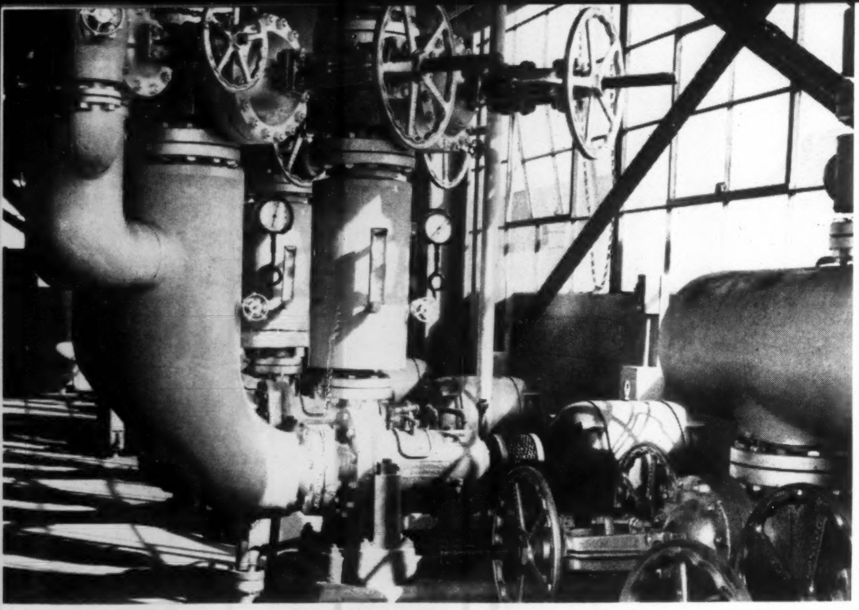
Case No. 10

AN AIR CONDITIONING plant was installed in a multistory building occupied by dentists and doctors. Each office was to be conditioned by an individual unit. All windows and doors were closed and fans stopped when the plant went into service, but not for long.

No provision had been made for introducing outside ventilating air. The medical and dental tenants had plenty to say. Most of them went back to the orthodox method and let Mother Nature and electric fans take over.

The owner admitted he was responsible for the type of system installed. He "didn't want to spend any more money than he had to."

"Fresh air can be provided for later," he said. However, he had not heard of the necessity for moisture removal and the cooling of outside air. The air coolers, as installed, cannot carry this additional load. ≠



THREE CIRCULATING PUMPS, specially designed for HTHW service, force the heat carrier from the boiler house to the heat users and back. Capacity of each is 475 gpm, but can be increased to 675 gpm by changing impellers and substituting larger electric motors

HTHW Heats Air Base Seven Ways

High pressure, high temperature water — 410 F and 300 psig — is distributed through 11,500 ft each of distribution and return piping, above and below ground, to heat 11 hangars and several other buildings at Westover Field, Mass.

BY J. F. GSCHWIND and J. A. BEMENT
Vice President and Manager Engineer
Ross Midwest Fulton Corp.

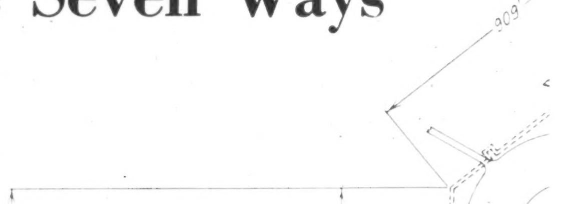
THE HIGH PRESSURE, high temperature water heating system recently installed for hangars at Westover Field Air Force Base, Chicopee, Mass., is the second system of its type installed at air bases in New England.

The heating plant and distribution system are designed to distribute high temperature water at 410 F and 300 psig. There are two 31.2 million Btu per hr boilers, connected to a common expansion drum. The distribution system consists of 11,500 ft each of distribution and return piping. Piping is installed both above ground and underground.

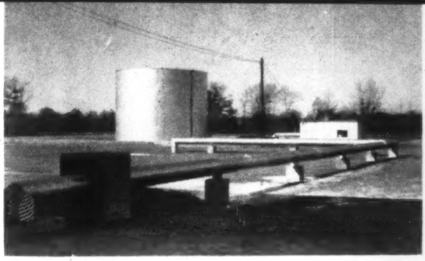
Heat Direct at System Pressure, Temperature

The high temperature water at the system pressure is being used directly to heat the hangars, except for radiant heating and domestic hot water requirements, in which case the high temperature water is converted to lower temperatures and pressures.

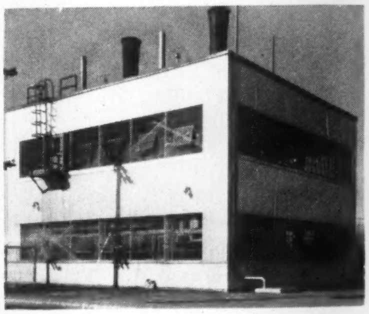
Eleven multipurpose hangars, a warehouse, a maintenance hangar and a deluge pump house constitute the present maximum heating load of 64 million Btu per hr.



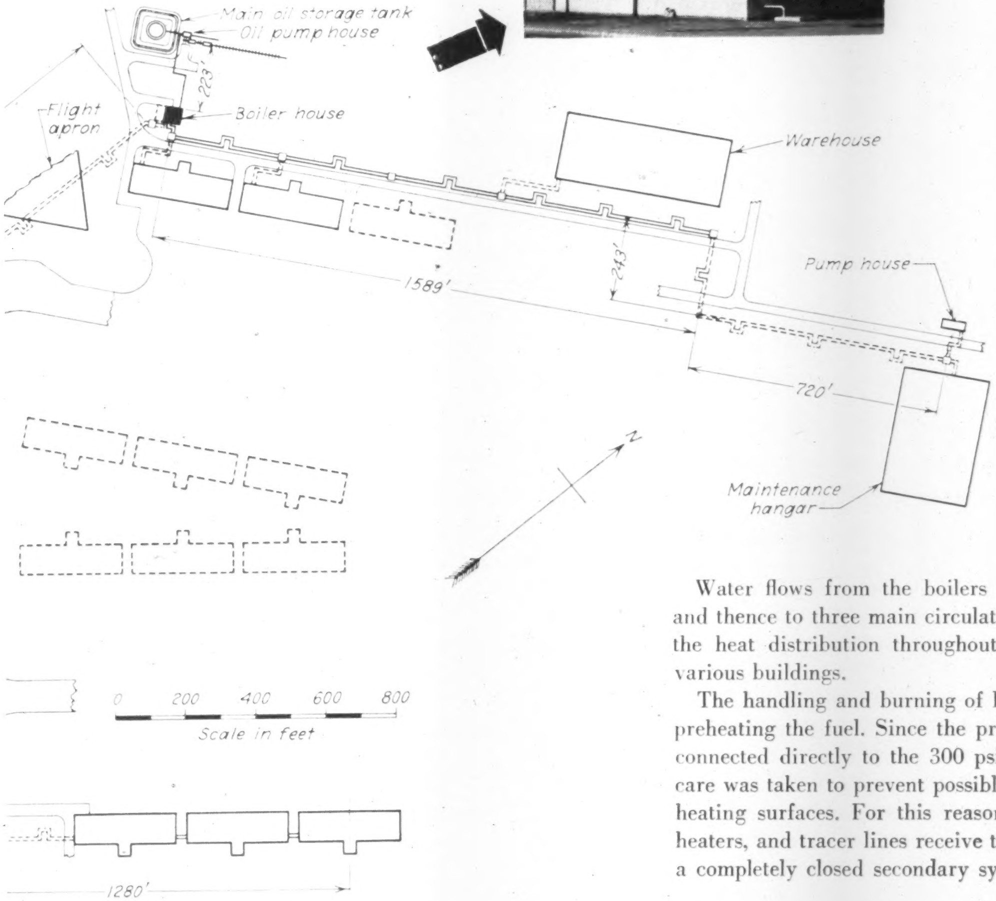
The heating system, however, is designed to accommodate seven future additional hangars, representing a load of 28 million Btu per hr, so that the total design load including accessories amounts to 93.6 million Btu per hr. Design specifications, providing for a maximum operating pressure of 300 psig for the entire system, easily allow for a flow temperature of 405 to 410 F.



OIL STORAGE TANK is adjacent to pump house, in which are installed two rotary, screw type pumps which pump the fuel to the boiler house



BOILER PLANT is equipped with two oil fired, 31.2 million Btu per hr, forced circulation hot water generators connected to a common expansion drum



Bunker C oil is used as fuel, with provisions for easy adaptation of the firing equipment to gas at a future date. The foundations of the HTHW boilers were also designed to require relatively few changes, should it ever become desirable to install grates for coal firing. The oil burners are automatically controlled through a pressure instrument receiving its impluse from the expansion drum.

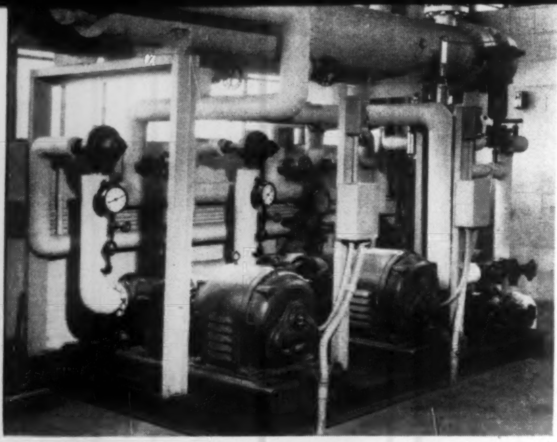
Water flows from the boilers to the expansion drum and thence to three main circulating pumps which assure the heat distribution throughout the mains and to the various buildings.

The handling and burning of Bunker C oil necessitates preheating the fuel. Since the primary heating system is connected directly to the 300 psig generators, particular care was taken to prevent possible contamination of their heating surfaces. For this reason, all oil preheaters, oil heaters, and tracer lines receive their supply of heat from a completely closed secondary system.

Low Pressure Steam Preheats Tank Cars

Since Bunker C oil is normally shipped by rail, a spur line therefore terminates at an unloading station near the 300,000 gal bulk storage tank.

A pump house shelters the equipment necessary for transferring the fuel from the tank cars to the storage tank or from the latter to the day tank next to the boiler house.



OIL PREHEATERS — shown here — and oil heaters and tracer lines receive their heat supply from a completely closed secondary system to prevent possible contamination of the generators

Low pressure steam, supplied by a HTHW heated generator in the pump house, serves to preheat the oil; the condensate is wasted, since it is likely to be contaminated.

Two rotary, screw type pumps which transfer the fuel to the boiler house must be started by an operator in the pump house because he must supervise the proper setting of the valves. The pumps can be stopped by remote control from the boiler house. The oil supply piping and the HTHW lines of the secondary system, between buildings and the bulk storage tank, are mounted closely together in a common, insulated, waterproof conduit to keep the fuel above 100 F for easy pumping.

An underground 25,000 gal tank next to the boiler house holds the daily fuel supply. This tank can also be filled by truck. Light oil is used for initial boiler startups and a 3000 gal tank was installed for this purpose.

A duplex oil pumping, heating, and straining unit supplies the boilers with fuel.

Boiler Heat Output Adjusts Quickly

The combustion control is of the proportioning type, maintaining automatically an optimum ratio between fuel feed and flow of combustion air. Since each boiler is fired by two wide range, atomizing oil burners, a turndown ratio as high as 10 to one is available. This feature makes it easy to adjust the heat output of the boilers quickly and in step with load changes of the system. Flame failure equipment and time delay relays assure proper purging of the combustion chambers.

In addition to the normal instrumentation mounted on the panel board, such as pressure gages, tank level gages, draft gages, and an expansion drum level indicator, there are also recorders for the leaving water temperature and the flue gas temperature of each boiler, as well as a Btu meter for the combined plant output.

Efficiency at Full Load Is 78 Percent

The generators, with water walls and combined convection surface, are for continuous flow. A minimum of refractories and insulated casings assures a minimum of heat storage. The overall efficiency at full load was specified to equal at least 78 percent.

The recirculation feature, common to this type of boiler, assures good heat transfer, cooling of the furnace walls, and removal of steam pockets and gases by means of a relatively high velocity of the heat carrier. The hot water generators operate in parallel, and their discharge is connected to a common expansion drum large enough to accommodate the output of a third identical unit in the future. The expansion drum is equipped with the usual safety valves and level indicators.

The combustion air and the hot exhaust gases are handled by forced draft and induced draft fans, respectively. Venturi type stacks were selected to keep the boiler plant silhouette as low as possible. Soot blowers were installed to keep the HTHW generator surface clean.

Accessory Provisions Include Makeup, Blowdown

An outdoor transformer station with three single phase 100 kva oil immersed, self cooled units serves to supply 480v current to the boiler house where 33 control units with reset type overload protectors are incorporated in a motor control center. A 110 v circuit is also made available for lighting and instrumentation.

Recuperative water treating and chemical dosage equipment will handle the small amount of makeup required and a limited storage of raw water and treated water is sufficient to take care of contingencies.

Since the HTHW systems are completely closed and hence require little makeup water, there is no need for continuous or frequent blowdown of the boilers. A small blowdown tank, buried along the outside wall of the boiler plant, is adequate for the purpose.

An electric driven compressor and receiver unit supplies compressed air to the soot blowers and to the pneumatically operated controls.

Secondary Hot Water Heats Seven Ways

This system has a maximum output of 3.6 million Btu per hr and furnishes hot water at 350 F to the following:

Suction heaters in bulk storage tank.
Steam generator in pump house.
Suction heater in day tank.
Preheaters of fuel oil.

Space heaters in boiler plant and pump house.

Tracers of oil lines.

Feedwater heaters.

With the exception of the expansion vessel, duplicate heaters, and circulating pumps, rated at two-thirds of the maximum design load, allow for flexibility and easy maintenance. This system also is completely closed and what little makeup may be required is furnished from the storage tank for treated water.

The flow temperature of the secondary system can be easily adjusted by setting the pressure controller that governs the heat input from the primary system, or, alternately, by manipulating the recirculation valves of the pumps. The operating pressure is normally set high enough to assure outward seepage, should any unforseen leakage occur within the oil preheaters.

Two Separate Sets of Heating Mains Required

As the heat users are dispersed over a large acreage, they are divided into two groups served by two separate sets of heating mains.

The south branch is 3100 ft long, and the east branch is 2700 ft long, and the mains are sized accordingly. Also there is a considerable difference in heating loads between each branch. The Btu requirements are further subject to change, as future buildings are connected to the system.

Three pumps, specially designed for HTHW service, force the heat carrier from the boiler plant to the heat users and back. There are no traps, condensate returns, pressure reducers or other accessories. The capacity of each pump is 475 gpm, but a future increase to 675 gpm can be obtained by changing the present impellers and substituting larger electric motors. One of the pumps is a standby.

The plant operators can easily check the water flow through each branch main by means of a flow indicator and adjust the water circulation as required.

Since the piping is subject to relatively large changes of temperature, anchors and expansion loops are provided at suitable intervals to absorb thermal expansion. Where mains cross roadways or flight aprons, they are buried in the ground. Accessible underground pits shelter branch connections and the necessary sectional valves. Flow and return mains are drainable to facilitate maintenance or the installation of future connections.

All mains above ground rest on concrete piers; the piping is insulated by means of molded sections of magnesia, completely wrapped in a roofing felt jacket and sealed with weather-proofing compound. Underground mains are embedded in a monolithic mass of reinforced insulating concrete, protected by a waterproof envelope.

Large, multi-outlet floor type unit heaters provide the major amount of heat in the buildings. They are connected to the high pressure, high temperature water system and have finned type heating surfaces.

Room temperature control is effected by modulating face and bypass dampers, actuated by thermostats. In some hangars secondary systems with automatic temperature control, take care of panel and floor heating requirements.

According to the operators, the system has been trouble free and very satisfactory ever since it started operating in the Fall of 1955. The system was designed by the J. O. Ross Engineering Corp., and was installed by C. N. Flagg & Co., Inc. ⧺

Selfcontained Units Condition Sidewalks, Spur Sales

The first completely air conditioned sidewalks were installed some months ago in the new, ultramodern North Towne Plaza shopping center in San Antonio, Texas. Now, store sales are said to be far ahead of what is normally expected.

The 16 ft wide sidewalk is air conditioned by three 7½ hp package units, with air supply ducts and diffusers above the window wall.

The stores leave their doors open, and use the large open area in front of the door for displays.

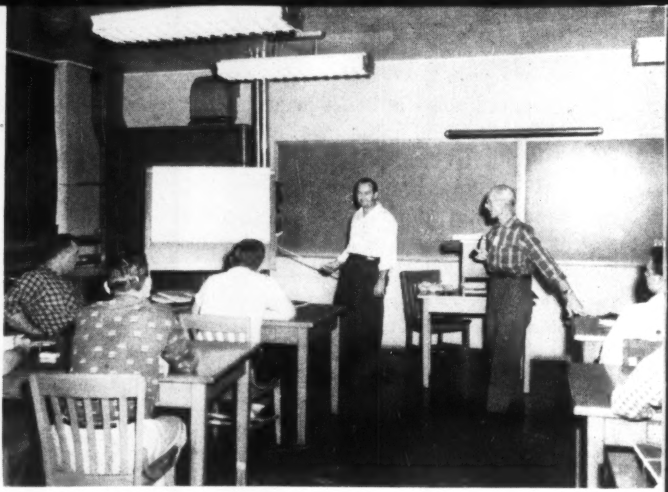
The air conditioning units are installed in three attractive adobe brick closets around the walk. The units are of the waterless type, using air cooled condensers on the roof.

The largest of the three closets also includes a 220,000 Btu per hr gas fired boiler to supply hot water for three 70,000 Btu per hr heating coils.

AIR CONDITIONED SIDEWALK at the North Towne shopping center, San Antonio, Texas, is served by three selfcontained units concealed in closets

The cost of operating the air conditioning units is estimated at approximately $150 per month. ⧺

THREADING a pipe or . . .



CALCULATING piping offsets . . .

Apprentice Training Pays Dividends

. . . at Standard Oil Co.'s Wood River, Ill., refinery

During regular working hours, at full pay, apprentices from pipe and other departments attend classes 64 or more hours per year. Classroom instruction given by selected engineers and foremen is aided by informal, on-the-job training. Here's how the program works.

BY BRACE H. LAMBERT
Asst. Supervisor of Training
Wood River, Ill., Refinery
Standard Oil Co.

THE OLD ADAGE, "time is money," was never more true than now. With wage rates for nearly all mechanical crafts at an all time high, it becomes increasingly important for employees to know their jobs thoroughly and to approach them with positive attitudes. Keeping the cost of labor used in new construction and in maintenance of existing facilities to a minimum works to the mutual advantage of both employer and craftsman. Training, both on-the-job and in the classroom, can contribute to the realization of both these sought after goals of increased job knowledge, with lowered costs, and more desirable attitudes.

A recognition of the benefits to be gained led to the formation during the summer of 1953 of an apprentice training program for 16 mechanical trades, including pipe fitters, at the Wood River, Ill., refinery of the Standard Oil Co. As this was developed, necessary clearances were obtained with the local labor union. The current apprentice training program is referred to as "New Plan" and is of four calendar years duration. A previous plan, referred to as the "Old Plan," was of only three years duration, each year consisting of 1872 clock hours. The training is divided into two parts referred to as on-the-job training, and classroom training.

All classroom training is given during regular working hours at full pay rates.

Apprentice training is conducted in two remodeled buildings centrally located within the refinery. The two buildings, which are joined by a passageway, house three classrooms, a storeroom, office space for six instructors and a secretary, an office for the training supervisor, and three restrooms. The large classroom can accommodate up to 20 students, while each of the two smaller classrooms can accommodate nine students. The larger classroom, one of the smaller classrooms, and all office spaces are air conditioned, which permits instruction to be carried out on a year 'round basis when necessary. Each classroom is equipped for maximum use of all types of audio-visual aids.

Apprentices enter the pipe department from the labor department by bidding on posted openings. Acceptance is based only on seniority, with no testing being done as a requirement for entrance. The difference in pay rate between the various years is as follows: Between 1st and 2nd years, 8½ cents; between 2nd and 3rd years, 9 cents; between 3rd and 4th years, 9½ cents; between 4th year and journeyman, 10 cents.

On-the-job instruction of the apprentices is given by foremen and journeymen in an informal manner. Classroom instruction is given by two instructors, one of whom is an engineer and the other a foreman from the pipe department. The engineer is primarily responsible for the theoretical aspects of the course, while the foreman is primarily responsible for the applied or practical phase of the training.

Instructors are selected on the basis of their knowledge of the subject, the respect in which they are held by the apprentices, their ability to express themselves in a logical manner, and to organize and present a large volume of detailed information.

Needs of Students Become Course Objectives

The preplanning of each year's classroom training is done by the general foreman of the pipe department, the other line foremen in the department, the instructors, and the apprentice training supervisor. Once it has been determined what topics are to be covered and to what depth they will be studied, the instructors arrange the topics in sequence, assign the number of hours to be spent on each, and following approval by the division superintendent, begin to assemble the information.

The courses are designed around the answers to two questions: (1) What do the students need to know and (2) What do the students need to be able to do? The answers to these questions form the objectives of the course.

One day is allotted between each session to permit instructors to prepare for the next session, grade papers, preview films, and perform other duties in preparation for classroom supervision. One week is used at the conclusion of each yearly course for the instructor to write a report, return borrowed materials, store surplus materials, and otherwise terminate the course.

Once it is determined how many apprentices are to be trained from the pipe department, the general foreman is contacted to determine the maximum number of men he can release to training daily. The total number of men to be trained, divided by the daily load, determines the number of days per session. The general foreman then groups his apprentices into the required number of classes to complete a session, and a notice showing assignments to classes is posted in the department.

Each apprentice attends class one full 8-hour working day during each of the sessions. Most of the courses have required eight classroom sessions or 64 hours per year. All of the apprentices receive 36 hours of training in basic mathematics and 36 hours of training in blueprint reading during their first year of apprenticeship.

How Instruction Is Given

The following list covers most of the instructional methods used in presenting material to apprentices:

a) Textbooks or training manuals.
b) Films.
c) Wall charts and display boards.
d) Manufacturer's booklets, catalogs, and other data.
e) Reference books.
f) Demonstrations performed by instructors.
g) Practice sessions performed by students.
h) Guest speakers.
i) Field trips to various shops and operating units.
j) Classroom discussions.
k) Lectures.
l) Tests.
m) Assignment sheets.

Lecturing is held to a minimum.

Many of the textbooks and training manuals used have been prepared by the training section at the Whiting, Ind., refinery or published by Delmar Publishers, Albany, N. Y. Some textbooks were obtained from the American Technical Society, Chicago. Various manufacturing concerns have been extremely helpful and cooperative in supplying motion picture films, wall charts, "how to" booklets, descriptive brochures, catalogs, and cutaway models of their equipment.

For the first and second year courses, display boards, tests, and assignment sheets were prepared by the Whiting training section and modified for our use. Materials for the last two years of the training courses were prepared by the Wood River staff.

Tests Show Students' Progress

Testing may be classified as classroom testing and "year end" testing. Normally, three tests are given during each year's classroom training course and the average percentage score on these three tests is recorded as a measure of the student's accomplishment in classroom work. Standard type questions such as multiple choice, completion, matching, identifying pictures, true-false, and so on, are used. Very little essay type testing is done.

Approximately one month before an apprentice is scheduled to advance to the next higher rate, a notice from the accounting division is sent to both the foreman of the pipe department and to the training section, asking that arrangements be made, to test the apprentice. A test, which is referred to as the "year end test," is prepared from a set of questions previously formulated by the foreman of the department. Usually 10 questions are used. These questions are keyed to pipe department job numbers and an attempt is made to emphasize those jobs on which the apprentice has had the most experience during the year. No questions are asked on those jobs in which the records show the apprentice has had no training. Once each year the foreman is notified of those jobs in which the apprentice has not had at least a total of 100 hours training. This assists the foreman in making job rotations.

No attempt is made to have the apprentice perform actual jobs for the sake of testing his performance. Because of the large number of men involved and the large amounts of material required, it has proved impractical to give each apprentice a performance type test. For these reasons, the year end test is a paper and pencil test covering field work. Information on job performance is obtained by other means, as discussed below.

How Apprentices Are Rated

Apprentices are rated in the classroom and also on the job, on those personal characteristics which influence job performance. A form entitled "Instructor's Report on Apprentices" is filled out by the instructors at the completion of each year of classroom training. The apprentice is rated on such factors as classroom attitude, rate of turning out classroom work, mental ability, ability to read and write, and willingness to improve himself on his own time.

On-the-job rating is done by the foreman to which the apprentice is assigned week by week. A check list of characteristics and space for the foreman's personal comments are provided on the back of the job cards supplied to the foreman for each apprentice weekly. Foremen are encouraged to use their own comments as much as possible. Foremen's ratings are recorded on 8½ × 11 cards, which are kept in the apprentice training office. Space is also provided on these cards for resumes of discussions with apprentices. These conferences may have been requested by the apprentice or by the staff supervisor in charge of apprentice training. All information regarding job performance and related personal characteristics developed during the conference is recorded. It is available to foremen and may be used by top level management when considering candidates for supervisory positions. In evaluating ratings of apprentices, long term trends are given more weight than are individual, isolated comments.

Systematic Records Kept

The forms used to maintain records may be classified into those used for: a) Ordering material, b) Aids to instructors, c) Rating and progress of apprentice, d) Conduct of classes, e) Training section administration.

A Kardex file is used to maintain record cards showing test grades, hours spent on each job, outside schools attended, and advancement of each apprentice. Hours spent on each job by each apprentice are machine tabulated from pay cards by the accounting division once a month and a report is made to the training section.

Grades and Ratings Determine Advancement

The decision to advance or to hold back an apprentice is made annually on the basis of his average classroom test grade, the grade made on the year end test, and the appraisal of his field work by the various foremen for whom he has worked. In general, unless his performance is unsatisfactory in all three categories, he advances to the next year's rate.

If a recommendation to hold him back is made, six months' additional experience and training are to be given him at his current rate. At any time during this six months' period he may request a re-examination and reconsideration of his qualifications. If he again fails to meet the required standards, he is removed from the program. It should be kept in mind that the aim of the apprentice training program is not to fail apprentices but rather to develop competent craftsman.

Training Manuals Popular with Journeymen

It was decided to provide apprentice training manuals to journeymen in the pipe department on an experimental basis to determine the demand for such manuals, and, if possible, to evaluate benefits to the department by such a practice. The demand for manuals has exceeded original estimates, but the extent of their value to journeymen has not as yet been determined. If even one hour per journeyman is saved in doing a job as a result of information gained by studying these manuals, their cost will be more than offset.

Both apprentices and journeymen are permitted to buy any text or reference book pertaining to their trade by means of a payroll deduction plan, thus availing themselves of whatever company discount on the cost of the books is available.

What Are the Results of the Program?

Most of the apprentices have expressed the opinion that the training given them is very much worth the time required to give it and that it is concrete enough to be applied directly in their jobs day by day. The wide ranges in educational background, age of apprentices, and previous experience, make it somewhat difficult to provide a training program ideally suited to every individual, but in spite of this all apprentices have been extremely cooperative and have made a real effort to use the training to the best advantage of both themselves and the company.

In addition to the expected financial return on the investment in training, consideration must be given to those values which cannot be measured in terms of money. Some of these values are: increased pride in workmanship, better morale on the part of the working force as a result of the feeling that their employer has a personal interest in their future, and the fact that an employee who can adequately do the job to which he is assigned will be a more satisfied employee.

Each instructor has expressed the feeling that he learned along with his students and that he was returning to his regular duties with a better understanding of overall plant problems. This cannot help but be of benefit to the departments from which the instructors were drawn.

Thus, it may be seen that there are benefits derived from having a force of competent tradesmen who are more satisfied with their work; who have increased knowledge and satisfaction on the job; and who can look forward to a definite, planned increase in wages while making satisfactory progress through the program. +

Sam
Lewis'
Page

Preheat Coils Freeze in 20 F Range

. . . over and over again. Repeated freezing of condensate when steam flow is reduced after room temperatures rise causes frequent splitting of lower tubes in a double row preheat coil.

In a ventilating and heating and refrigerated air supply project in a laboratory there is one large preheating coil that serves three supply fans. Let it be known that I would not design such an ill considered plant.

Throttle Preheat Steam Supply

No recirculation of any part of the air is permissible in this laboratory which handles lethal gases, and control of the entering air temperature must be by throttling the steam supply to the preheating coils.

These preheating coils are to regulate the temperature of the relatively cool air delivered into the laboratory, for reducing the temperature in winter after the room has become too warm. Control of this air by adjustment of face and bypass dampers at the preheating coils is not permitted, for fear of unacceptable fluctuations in the air pressure. Air always must flow into the laboratory; never out!

Coils Freeze Repeatedly

The preheating coils are copper, two rows deep across the air stream. They are horizontal tubes with copper fins, and each tube has an interior concentric steam distribution pipe. Freezing is a repeated occurrence in this system.

When the entering air is colder than 20 F, down to zero F or colder, no freezing occurs because at that condition the two rows of convectors are needed and do receive enough steam.

When the entering air is 25 F or warmer, the constant opening and closing of the steam supply valve apparently prevents freezing.

Bottom Tubes Split

When the entering air is close to 20 F, however, the bottom tubes of this long tube preheater freeze and split. Evidently the thermostatic control, in order to prevent overheating the air, reduces the steam flow to the point where condensate collects in these bottom tubes and changes state to ice.

The maintenance men have learned, in making emergency repairs by ever helpful solder on copper, to remove the interior steam distribution pipe from the repaired outer tube. We may learn from this frosting, not to employ more than one finned tube of this kind across the air stream under control of a modulating steam valve. Two such tubes at critical temperatures must "hunt" too avidly.

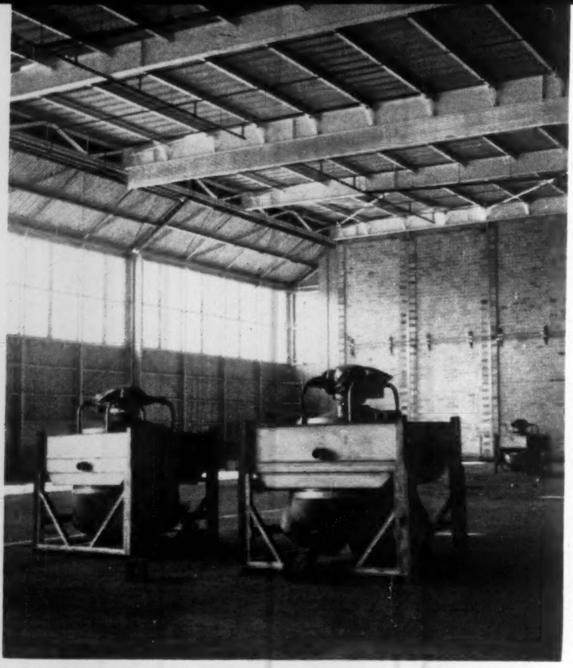
Urges Separate Single Rows

If one row of tubes is not enough, then a separate single tube row should be installed, with a second separately controlled steam supply valve. We learned long ago, in a big Chicago hotel, not to employ several different air supply fans, unlike in size and resistance, while all draw their air supply through a single cooling-heating convector or filter. There should be a separate coil for each fan.

This curious incident of repeated freezing of condensate in efficient steam coils when the outdoor temperature is in the range of 20 F seems to be worth noting. When the outdoor air is much colder or is a little warmer, these two row preheaters do not freeze.

In this situation I could be tempted to develop a preheater construction much less sensitive. ⌗

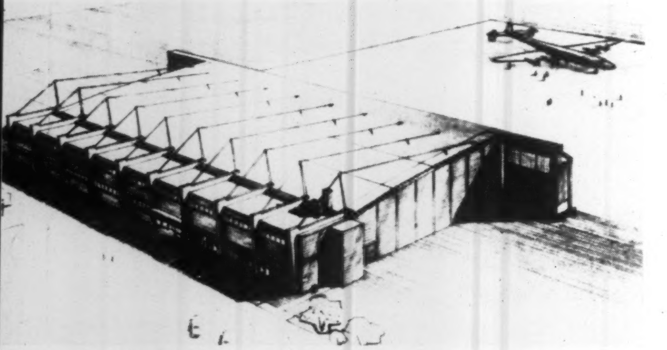
SAMUEL R. LEWIS, *consulting mechanical engineer and a member of HPAC's board of consulting and contributing editors, comments informally each month on practical heating, piping, and air conditioning problems.*



REVOLVING UNIT HEATERS, shown here before installation 40 ft above floor, utilize 5 psig steam from two induced draft boilers and produce 5.4 million Btu per hr

Unit heaters, perimeter radiation, heating and ventilating units, and package unit air conditioners are all used to . .

Heat and Cool



UNUSUAL DESIGN of hangar provides a support free bay, 135 ft deep × 270 ft long × 45 ft high, and a ground floor area of 53,000 sq ft

. . . other features include a door apron snow melter and a hot water deluge de-icing system

LOW PRESSURE vacuum steam heats the new $1¼ million TWA maintenance hangar at the Philadelphia International airport several ways. In addition, package units air condition part of the building year 'round.

The structure is one of the first hangars of its kind. Having a total volume of 1.4 million cu ft, it provides a single bay 135 × 270 × 45 ft high space free of any obstructing columns. The design provides for future extension to double the width to 540 ft, with no interfering supports.

The roof is supported on steel ribs hung from steel cables forming a one sided cantilever structure. The main hangar doors are sectional, sliding steel type, consisting of six panels, having a 270 × 42 ft opening.

On the north and east sides of the hangar are annexes housing offices, shops, storage areas, garage, service, paint shops, and flight personnel facilities.

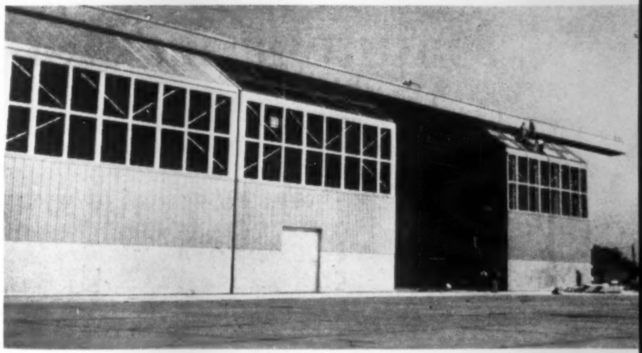
Including hangar and overhang, the ground floor covers 53,000 sq ft. Flight and maintenance crew lounges, dormitories, and other facilities are provided for in a 2600 sq ft mezzanine and 12,000 sq ft second floor area.

Parts of the building exterior are finished in brick. Other sections are paneled with insulated asbestos.

Under one annex is a subfloor 10,000 gal fuel oil tank.

Three Boilers Produce Steam

Two heating boilers are of the fire tube, induced draft type, designed to burn No. 6 fuel oil. Each has a total capacity of 9000 lb of steam per hr. The boilers are also designed for future burning of coal, if desired, with minimum changes to the boiler.



HANGAR DOORS slide smoothly regardless of weather as a result of 1800 sq ft snow melting system below door tracks

Areas of New Maintenance Hangar

A third boiler, of the sectional cast iron type, designed to burn No. 3 fuel oil and having a net steam capacity of 3600 sq ft EDR, furnishes steam for a hot water generator, to heat the lubricating oil, and to preheat the No. 6 fuel oil for the heating boilers.

In some of the annex rooms, such as the shop and storage areas and fleet service section, heating is accomplished by thermostatically controlled unit heaters. In other rooms, such as the paint shop and flammable storage areas, automatically controlled heating and ventilating units provide sufficient outside air for ventilation.

The heating system for the hangar consists of six revolving projection type unit heaters having a total combined heating capacity of 5.4 million Btu per hr, and handling a total of 96,000 cfm of air. The calculated load for this space, including infiltration, amounts to 2.2 million Btu per hr. Due to the heater locations 40 ft above the floor and because the unit heaters are called upon to evaporate excess water from the floor as a result of the deluge de-icing system, additional capacity was provided in the unit heaters.

Four Package Units Condition Small Areas

Second floor annex rooms for flight personnel — pilot room, hostess room, assembly, and lounge rooms — are air conditioned year 'round. Four selfcontained units have a total capacity of approximately 25 tons of refrigeration and provide approximately 12,000 cfm of conditioned air.

Additional direct radiation is installed below windows in these rooms to combat downdrafts.

Snow Melter Protects Door Tracks to −10F

A snow melting system provides for continuous use of the hangar doors regardless of the weather. The panel system consists of $1\frac{1}{4}$ in. wrought iron piping buried in the concrete slab below the sliding hangar door tracks.

The system is designed for an outdoor air temperature of 26 F, an average heating medium of 120 F, and a 20 F temperature drop. Sufficient ethylene glycol is added to the circulating water to provide protection against freezing to −10 F. The total snow melting panel size is approximately 1800 sq ft.

Hot Water Deluge System De-Ices Planes

A deluge type of de-icing system for aircraft utilizes an instantaneous hot water generator using steam from the heating boilers. The capacity of this generator is such that an entire plane can be de-iced in a matter of a few minutes.

The hot water generator utilizes practically the entire capacity of one of the heating boilers, but is not included in the boiler load because (1) the system is used infrequently, and (2) the ambient temperature is usually above the outdoor design temperature when snow and ice occurs.

Four deluge sprinkler systems with 6000 gpm capacity guard against fire. Suspended between sprinkler systems are 3 ft fire confining curtains. The dual drive fire pumps are diesel operated.

The architects and engineers for the project were The Ballinger Co. ♯

Maintenance Job Is Changing Fast

The maintenance job is getting bigger and more complex all the time, reflecting advances in technology, increased production capacity, and the growing shortage of qualified trained personnel. This is the picture of the maintenance situation given by experts in all types of industries at the recent eighth annual Plant Maintenance and Engineering Conference in Cleveland.

The three day conference was held in conjunction with the Plant Maintenance and Engineering Show. Together they drew more than 20,000 industrial executives and engineering, maintenance, and production personnel.

The changing pattern, the experts emphasized, creates new problems. Their solution requires real teamwork, more effective planning, new techniques and tools, and more adequate training programs.

The maintenance problem was dealt with in various specific aspects in general sessions, panel discussions, and smaller group meetings. From those of special interest to heating, piping, and air conditioning engineers and contractors, HPAC presents here the highlights in abstracts of the speakers' own words.

• *maintenance job is bigger than ever*

"THE JOB to be done by maintenance is bigger than ever," said L. C. Morrow, general chairman of the eighth annual Plant Maintenance and Engineering Conference. He said, "Capital equipment spending in 1957 will be 14 percent above the amount for 1956.

"At the same time, there are too few people to do the maintenance job. Except for the building trades, more of the U.S.'s skilled workers are employed on maintenance work in industry than in any other type of occupation. The 9 million skilled workers in the U.S. require 250,000 additions to their ranks each year merely to replace losses; only 100,000 are available from training programs and immigration, thus leaving a shortage of 150,000 to be obtained elsewhere.

"If not enough workers are being trained to keep the skilled force from getting smaller, how can there be enough maintenance workers to meet the increased demand created by more capital equipment?

"Unfortunately, even now, the maintenance job is not being done as well as it should be. A survey of 40 plants, with maintenance costs ranging between \$1/4 million and \$1 1/2 million annually, made by a firm of consultants shows the following:

"a) Every plant was handicapped by the lack of trained maintenance engineers. In only one was there a man with formal engineering training in charge of maintenance.

"b) In 85 percent of the cases, budgeting of maintenance expenditures was nonexistent or ineffective.

"c) In all but two cases, construction and repair contracts were given out without competitive bids. In half the cases, purchase orders were issued after the work had been done.

"d) In 75 percent of the plants, no storeroom record system worthy of the name was found.

"e) In four out of five of the plants maintenance employees were idle 20 percent of the time.

"f) In 60 percent of the cases, maintenance supervisors and foremen were found to be much less effective than corresponding foremen in production departments.

"The firm that made these findings is inclined to believe that they are representative of the national picture, though pointing out that its summary represents a consensus of 40 plants, and is not the result of a statistically balanced, scientific sample.

"Even if the findings are not nationally representative, they are serious enough to be alarming. The conditions reported exist in 40 of one consulting firm's clients, and they were discovered within a single year.

"Most of the shortcomings must be made up by joint action of management and maintenance. Both must concern themselves with items like budgeting, store room systems, contract policies, training, and cost control. Once the steps requiring joint action have been taken, it will be easier for maintenance to go ahead with those steps it must take by itself."

• new maintenance methods and tools needed

"ADVANCING TECHNOLOGY such as in instruments and controls is changing the character of the maintenance problem," said O. S. York, manager, maintenance engineering section, engineering service division, engineering department, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

"Since 1940 we have seen our company's instrument investment increase 500 percent. The investment in special control valves has increased from $100,000 in 1944 to $6 million in 1956. The investment in graphic panels, which simulate the process on the instrument control board, has increased from $100,000 in 1946 to $5 million in 1956. The use of photometric analyzers, an electronic instrument for measurement based on the color spectrum, has increased from just 10 installations in 1949 to 170 installations in 1956.

"New engineering materials are changing the character of the maintenance problem. In the short period from 1948 to 1955, we have seen increased use of such plastic piping systems as plastic lined steel pipe, polyethylene, polyvinyl chloride, and polystyrene rubber. In the case of polyethylene, we had only one installation in 1948, but by 1955 there were over 60 plastic piping systems installed in our company.

"As these new and improved materials of construction become available, new skill requirements, methods, tools, and techniques will be required by the maintenance organization to take full advantage of their potentialities.

"Wage rates have been rising and the labor portion of the total maintenance cost has increased from 40 percent to 60 percent in the past 10 years, and will probably increase to 70 percent or more in the future. Already in one of our plants where a very extensive preventive maintenance program is in operation, the labor percentage is nearer 80 than 70. More labor is required in normal routine adjustments and inspections during scheduled preventive maintenance than in costly material replacements during breakdowns.

"With wage rates increasing and also the labor-material ratio increasing, it will be necessary to develop new maintenance techniques if the maintenance labor force is to be used economically and effectively. It will be necessary to eliminate manual operations wherever possible.

"In many cases, it has been estimated that only 15 to 20 percent of the total labor on any job is actually required in the repair. The balance of 80 to 85 percent is required in the makeready, preparation, transportation, and cleanup. In our company we have found this particularly true in jobs such as insulating pipes, where costly scaffolds have to be built and torn down in order to replace a short section of insulation. Such items as ladder wagons should be evaluated and may be justified as wage rates increase. New maintenance techniques, particularly for cleaning pipe and equipment, must be developed in order to reduce equipment outage, save costly labor, and improve continuity of operations."

• how to get teamwork in maintenance organization

"TEAMWORK adds something which makes the combined result greater than the simple sum of the efforts of the individuals," said Harold M. Sylvester, special assistant for maintenance, Office of Assistant Secretary of Defense, Washington, D.C. "Is this extra result worth going after? Many of us think so, and are willing to take the required steps in order to have our maintenance organization work as a team.

"The only way to get it is to work for it. Here's what's involved:

1) *Selection of the right people.* From the top to the bottom of a maintenance organization the people should be interested in providing a service, and in working with others to attain this end. A man should get pleasure or satisfaction out of rendering a service to his plant, his fellow workers, and his organization. He should take pride in his work.

"A man selected to be a supervisor must have technical ability in his own trade, plus more than a passing knowledge of the several trades related to his own.

"In maintenance, a sense of responsibility is as important as in production work, if not more so.

"2) *Assignment of duties.* Duties should be clearly defined at all levels. Few errors can cause as much confusion and melt away teamwork as uncertainty of assignment or overlap of responsibilities.

"Day by day assignments should be clearly understood and measurable as to quantity, quality, and efficiency.

"Each individual must be told where he fits into the organization.

"3) *Fixing Responsibility.* Responsibility should be distributed on a definite basis. A job or task can be broken down to its component parts, one of which is the overall responsibility for coordination of the whole work and the follow through.

"Men will strive to give what is expected of them, not very much more or less.

"It is surprising how easy it is to omit one part of a job and fail to assign the responsibility for that part to an individual. A simple illustration of this is the failure to designate the responsibility for cleaning up after the completion of the work.

"4) *Setting Up Standards.* First establish a level or degree of maintenance to be achieved based upon economical limitations, production schedules, lost time delays, and so on. Then develop work time standards based upon maintenance level standards.

"5) *Meetings of supervisors with maintenance department head for planning and communication.*

"Regularly scheduled meetings provide an opportunity to discuss actual progress, assignment of duties and responsibilities, planned workload and new developments.

"Top management needs progress information to enable discussion and evaluation of past performance with subordinate supervisors.

"Top management must outline future work requirements — plans — and their effect on the working forces.

"An excellent opportunity for communication of policy information as well as an opportunity for middle management to take part in future planning exists when supervisors are encouraged to contribute constructively to discussions.

"6) *Meeting of supervisors with their workers for communication.* Regularly scheduled meetings provide similar opportunities as discussed above. At this level, however, discussions must be directed toward the specific viewpoint of the worker rather than from a general overall policy viewpoint.

"So that the initial step in upward filtering of problems from the workers' level to that of management is effectively accomplished, workers also should be encouraged to contribute constructively.

"7) *Fitting the shop stewards into the picture.* The shop steward, as the advisor to union member workmen and as the adjustor for minor complaints, disputes, and grievances, serves the same function for labor problems as the supervisor serves for other management and operational problems. As such he should be encouraged to feel equally responsible to both management and labor.

"He should make every attempt to resolve labor problems with supervision before taking them to the union for negotiation with top management. Only in this way can a satisfactory labor-management relationship be effected which does not undermine the policies of top management.

"8) *Contests, awards, and other devices to include a spirit of friendly rivalry.* Competitions tending to develop a spirit of friendly rivalry between production groups can be exploited in such areas as meeting planned production schedules, accident prevention, and suggestions for improved methods or tools.

"Any contest or competition should have some award connected thereto — monetary, performance rating, and/or letter of commendation.

"9) *Giving cost and downtime facts to everyone who can influence them.* Production data should be filtered down from management through supervision to workers to encourage competition between shops. Let the worker know how management views results of his work, and make the worker feel a part of his team.

"This can best be accomplished by meeting at various levels with subordinate supervisors through the use of visual aids indicating monthly action, status of work, and trends.

"Further, the forwarding to supervisors of facsimiles of production charts and copies of analyses gives an insight into trouble areas so that corrective action may be taken by the responsible individual.

"This stimulation of interest is gained by having those concerned feel that management thinks enough of its employees to keep them informed of all matters rightfully related with their work.

"10) *Bonus systems are another method of stimulating employee interest and improving work.* A good one is excellent for morale, a poor one can have the opposite effect.

"Remember, however, that bonuses and incentives are not a substitute for good supervision."

Much can be gained by teamwork.

• *think big about training maintenance personnel*

"We must think big and creatively about training the manpower to build and operate the mechanical miracles of the future," said Ralph G. Smith, director of maintenance education and assistant director of labor relations, Dow Chemical Co., Midland, Mich., Div. "If we train our technical people adequately to meet the technical demands of today, they will be able to meet the technical demands of the future.

"Selection is the first and perhaps the most important phase of our training program.

"A second most important principle is to determine rather specifically the need for training supervisors. Several techniques can be used:

"1) Rating performance of supervision.

"2) Tests.

"3) Attitude surveys.

"4) Questionnaires, in which supervisors check areas in which they feel they need training.

"5) Observations by individual supervisors.

"6) Talks with production supervision about relationship with maintenance departments.

"The next step is to determine the course content. Most subjects are in the area of human relations, and attitude development, rather than in the area of job knowledge or job skill.

"Some other questions that need answers when planning and operating a supervisory training program are:

"1) What methods and techniques will be used?

"2) When and where will the training be done?

"3) Who will handle the training?

"4) What about presupervisory training?

"5) How much will the program cost?

"6) What are the results?

"Supervisory training deals mostly with people, not things; with personalities, not technical know-how.

"On the other hand, nonsupervisory training deals mainly with improving actual mechanical skills. Some basic general provisions well to include in this program are:

"1) Selecting qualified men for training.

"2) Determining standards of performance of the trainees.

"3) Measuring performance of trainee against the standard of performance.

"4) Job progression schedule related to training schedule.

"5) Are job descriptions of each journeyman classification agreed upon?

"6) A means of settling individual trainee problems, such as what to do when the trainee does failing work.

"7) A means of determining quantities of men to be trained.

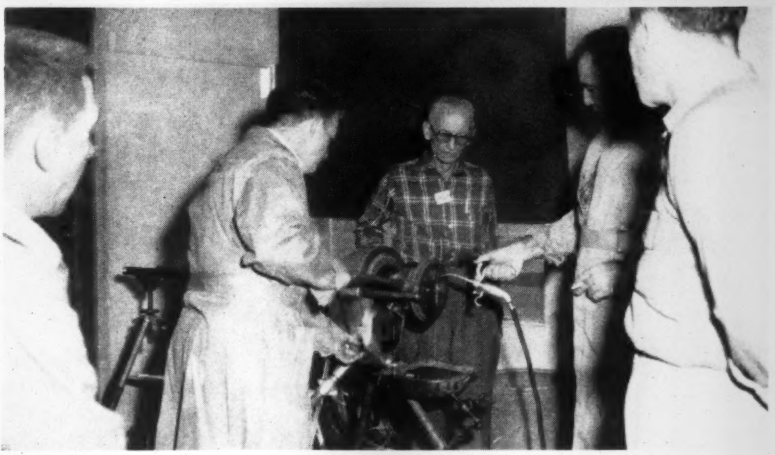
"8) A means of determining how, when, where training will be given.

"9) Has someone clearly been given responsibility of seeing that the training program is carried out?

"Include in the course only the material which is necessary to know to do the job for which the man is in training. Anything beyond that I call training for training's sake. The job description or job evaluation study is a good criteria upon which to base course content.

"To get material for the courses, the best practice is to develop and prepare it within your own organization. Admittedly this is costly and time consuming. Usually when starting out, companies buy the course material and then gradually write up their own as needs arise and as the program grows. An excellent help on this subject is to contact companies who have successful maintenance training programs in operation.

"To put teeth into your program and to hold your men to the standards you want, I suggest a strong in-training testing program including periodic quizzes, final exams, and qualification tests. Rating sheets which evaluate the day to day performance of the men in the shop and field are very helpful tools and should be used whenever possible.



TRAINING of pipe fitter apprentices should include instruction in the correct use and maintenance of all the department tools and equipment, as shown here at the Wood River, Ill., refinery of the Standard Oil Co. The story of this plant's training program begins on page 114

"After planning the what, how, when, and where of a training program, a little question always pops up: 'How much will it cost?' A detailed estimated budget is the starting point, followed by a simple accounting system that can tell you how the budgeted money was actually spent. A great mistake that many training people make is to let their training expenses become buried and lost in a wide variety of operating accounts and expense items so they just can't say: 'Here is what our training program costs.' Put it on the table — let management take a healthy look at it — it won't be as embarrassing as you might think.

"Now, we come to the jackpot question: 'What are the results?' Frankly, I've not yet found a good answer. I doubt that there is a method of figuring results in dollars and cents that will stand up under the attack of the management who does not believe that it pays off in dollars and cents.

"I firmly believe that the training man is not the one to ever try to justify his own existence. He can't. Training people have only one function: service. An evaluation of the training program by those who directly use the service is the only true test of its worth. Detailed job costs, man hour productivity data, reduction in turnover rate, and other efficiency measurements, improved morale, and fewer grievances, are only a few factors which may indicate the results of training.

"Here's a brief bird's eye view of our maintenance training program:

"1) We have formal training programs in 26 trades with training agreements developed jointly by the company and union covering such items as: selection qualifications, class schedules, shop and field training provisions; job progression schedules; grading and rating procedures; and method of handling failures.

"2) Seven full time men in the maintenance education department, besides myself, plus about 12 shop supervisors who devote part time to assisting with class instruction and administration of shop and field training.

"3) We have about 150—200 men in formal training programs at any given time.

"4) Classes vary in size from one to about 15 men and meet from one to six hours per week, with some lab classes meeting longer per week." ≠

Another article on plant maintenance, covering development of a standards book, pipe replacement problems in a foundry, how a chemical plant keeps a full stock of valves, fittings, and other materials for proper maintenance, and how another plant solves special maintenance problems in a continuous operation, will be published in an early issue of HPAC.

Teamwork Must Cure Air Ills *Now*

The alarming increase of air pollution is dangerously speeding up the biological unbalance of the earth's atmosphere, says the author. This mounting threat to survival can be effectively coped with only by massive coordinated efforts by teams of specialists. He outlines from his experience and observation measures that are being taken to improve atmospheric control, but warns that intensified effort is needed now to assure survival.

BY RAYMOND B. ALLEN, M.D.
Chancellor
University of California at Los Angeles

THE EARTH'S ATMOSPHERE, once thought a limitless resource, is now recognized as a limited one. Already, in areas of great population and industrialization, the problem is alarming. Before it becomes staggering — indeed to assure human survival — greatly increased cooperation is needed among scientists, engineers, medical men, and others in the study and solution of problems affecting adaptation of man to his ever more complex environment.

The increasing pollution of the air with byproducts of the activities of people in industry, home, and travel is converting our atmosphere into a giant sewage system. When natural ventilation by the winds fails because of climatic conditions, pollutants stagnate, and man's senses tell him that atmosphere is indeed a limited resource.

As there is no one source of pollutants in the atmosphere, there is no one breed of specialist who will be able to provide solutions to this problem. In Southern California, for example, pollution is being studied by a great variety of specialists: chemists, photochemists, physicists, chemical and mechanical engineers, meteorologists, physicians, lawyers, government officials, public information and education experts, and numerous technicians.

From these studies a greater knowledge of air chemistry and air pollution control is developing. These new specialties, along with the possibility of controlling climatic conditions in another generation, point the way to the solution of atmospheric environmental problems.

The Los Angeles effort to solve a communitywide problem is perhaps the most massive in progress anywhere. Millions of dollars have already been spent. Too often, American communities are not galvanized into action unless there is a present danger which can be dramatized to catch their attention and pocketbooks. But there is now keen recognition by the people of the Los Angeles basin that if air pollution is to be reduced to tolerable levels, this can be achieved only through increased research, development of air pollution control devices, and improved enforcement. Moreover, it is recognized that the total effort must be greatly accelerated if we are to do more than keep abreast of the air pollution byproducts of population and industrial growth.

The air pollution problem has had its effect on the air conditioning industry. More attention is being given to conditioning the atmosphere within buildings to prevent the intrusion of pollutants into these closed environments. For it will be many years before the outside atmospheric conditions at certain periods of the year in the Los Angeles basin will be tolerable.

History's Biggest Air Study Under Way

The most important large scale research program having to do with our physical environment in man's history is that for the International Geophysical Year, beginning July 1, 1957. That atmospheric conditions will receive great attention in this global research effort is indicated by a paragraph in the special report prepared by the U.S. Committee on the International Geophysical Year — of which Joseph Kaplan is chairman — of the National Academy of Science, Document No. 124:

"The atmosphere is responsible for a number of fac-

The author, formerly executive dean of the Chicago professional colleges of the University of Illinois, has a broad understanding of medical and engineering education. He aided greatly in the development of the University of Illinois research programs which required the cooperation of the biological and physical sciences.

This article was adapted from a speech delivered at a dinner honoring Dr. A. C. Willard, president emeritus of the University of Illinois, and four former staff members of the university. The dinner was held during the recent 63rd annual meeting of the American Society of Heating and Air-Conditioning Engineers in Chicago.

tors crucial to life: oxygen, moisture, and insulation against deadly radiation from the sun. No property of the atmosphere, however, is more important than its motion. Winds distribute heat from the tropics to other regions, transport moisture from the oceans and drop rain on the continents, remove polluted air from the cities, and bring in clean air."

From these studies of atmospheric movement in the Arctic, Antarctic, and Equatorial regions, we should learn more about the conditions which control the temperature, and water content, and other characteristics of the atmosphere as it churns and blows over the earth's surface. We should also become more aware of the fact that all men, animals, and plants, as breathing organisms, are interdependent parts of the air around us.

15 F Warming Would Make World Tropic

Some of the implications of studies such as the International Geophysical Year is undertaking have been brought to our attention by no less an authority than the late Dr. John von Neumann, brilliant mathematician and member of the Atomic Energy Commission and the Institute for Advanced Study, in his analysis of the question "Can We Survive Technology?" (a chapter in *The Fabulous Future—America in* 1980.)

In this analysis, Dr. von Neumann points out that probably more than half of the carbon dioxide released into the atmosphere by the burning of fossil fuels during man's history on earth has occurred in the last half century. This fact alone, he said, "may have changed the atmosphere's composition sufficiently to account for a general warming of the world by about 1 F.

"The volcano Krakatao erupted in 1883 and released an amount of energy by no means exorbitant. Had the dust of the eruption stayed in the stratosphere for 15 years, reflecting sunlight away from the earth, it might have sufficed to lower the world's temperature by 6 F. In fact, [the dust] stayed for about three years, and five such eruptions would probably have achieved the result mentioned. This would have a substantial cooling effect. The last Ice Age, when half of North America and all of northern and Western Europe were under an ice cap like that of Greenland or Antarctica, was only 15 F colder than the present age. On the other hand, another 15 F of warming would probably melt the ice of Greenland and Antarctica and produce worldwide tropical to semitropical climate."

However, as Dr. von Neumann made clear, the science of weather and climate control is neutral and does not take into consideration the human question of whether man will use these control devices for constructive or destructive purposes. If the problems of the accommodation of the individual to his fellows and to his total physical environment are anything like what Dr. von Neumann suggests they may be, then there is not too much time remaining for all of us to put our houses in order and really mean what we say about the importance of cooperative effort.

Scientific Teams Work Together

One of our first great engineers to realize that engineering is more than a technology — that it is a professional discipline and its basic function, like that of any other profession, is service to people — was Dr. Arthur Cutts Willard, president emeritus of the University of Illinois and a past president of the American Society of Heating and Air-Conditioning Engineers. As early as 1910, in the pioneer days of modern mechanical engineering, Dr. Willard established his leadership as a research worker and teacher.

Dr. Willard became a full professor of heating and ventilation at the University of Illinois in 1917 and head of the department of mechanical engineering in 1920. Then he became acting dean of the college of engineering and director of the engineering experiment station. He assumed the presidency of the university in 1934. His consulting work with the government and industry during all these years of university service achieved national and international recognition and acclaim.

CONGRATULATIONS are extended by Dr. David D. Henry (3rd from l), president of the University of Illinois, to Dr. A. C. Willard, president emeritus, honored at a reception and dinner in Chicago recently. Other UI men honored: Dr. Allen (l); A. P. Kratz (4th from l), professor emeritus of mechanical engineering; Dr. H. H. Mitchell (r), professor emeritus of animal nutrition; and Dr. Robert W. Keeton (deceased), professor emeritus of medicine and longtime head of physiology research. Looking on is Cushman Bissell (2nd from l), trustee

He pioneered not only in the research involved, but also in the administrative and organizational operation of the university as it affects industry and government. It was this kind of insight and broad understanding which has since made possible closer cooperation between engineering and the physical and life sciences within the university and between the university and professional societies, industry, and government in research programs. An important outcome of these cooperative endeavors at the University of Illinois was the development of the physical environmental laboratories at Urbana and Chicago.

Increasing Collaboration Required

These developments at Illinois are outstanding examples of the idea of interdisciplinary and professional studies and cooperation, an idea which is now broadly recognized as the best approach to the solution of many of the central problems of contemporary society and of the individual in the ferment of change which technology stimulates. It has become impossible for any one individual, no matter how well trained or brilliant, to absorb the accumulation of knowledge and skills in the natural sciences and their applications to engineering, medicine, and agriculture. Rather, the tremendous advances in science and technology of this century have increased the need for collaboration and teamwork among the professions to bring new knowledge and skills to man's service.

Thus the need for collaboration among specialists on this great problem of atmospheric accommodation and control is evident. The University of Illinois has demonstrated in its numerous studies the valuable results of such collaboration. Studies here and elsewhere have largely determined the physical and atmospheric control and conditioning necessary for the comfort and health of people in the home, factory, and office and the physical and economic significance of proper conditions for plants and animals as well. The bibliography* of such collaborative studies from this institution alone is sufficient evidence to convince anyone of their value.

Today science and technology are being challenged on many new and perplexing frontiers as a result of the accelerating pace at which man is upsetting biological balances.

I believe we are entering a period in which knowledge of the total physical and social environment of this troubled planet is the key — the only key to an understanding of the conditions we need to assure our survival. We must be willing to work together and to accommodate our social institutions and systems to advancing knowledge of our physical environment and energy resources. Looking back over the centuries, and particularly this one, there is reason to hope that man will respond to the challenge of these great developments. ╪

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*Controlled Atmospheric Environment in Relation to People, Animals, and Plants, a reference list of publications compiled by the Physical Environment Unit, University of Illinois, Urbana, Ill. Copies available on request.

Air Conditioning Soaring, Survey Shows

- **trend up in mild climates**
- **commercial, industrial systems becoming competitive necessity**
- **well engineered central systems with water conservation moving up fast**
- **big general increase seen by 1960 and 1965**

SUBSTANTIAL GAINS in air conditioning with predictions of consistent future growth are reported in a survey of public utilities recently completed by The Trane Co.

Responses from 50 power companies and water departments queried in leading cities across the U.S. show these facts:

1) Every company reported marked increases in the installation of air conditioning in its area, as measured through tons of refrigeration on its lines.

2) The degree of increase was more pronounced in the South, but the difference between other land areas of the country was not great, indicating that outside temperature alone is not responsible for the growth of air conditioning.

3) Commercial and industrial air conditioning are becoming a competitive necessity in many parts of the country.

4) Power and water companies expect an upsurge in the use of air conditioning in the years ahead, and many are making plans now to meet the increasing demand on their facilities.

• *One highlight* of the survey was the developing trend towards air conditioning in areas not normally regarded as outstanding markets because of their mild climates.

For example, air conditioning installations in northern and central California showed a sharp increase for 1956 over figures for 1955, according to Pacific Gas and Electric Co.

For the first eight months of 1956 industrial and commercial air conditioning equipment installed in these sections of California amounted to 7600 hp. Projected for the entire year but taking into account the fact that air conditioning installations are normally lower during the fourth quarter, the total figure still is substantially higher than the 9700 hp for 1955.

"Three of the newest 8 to 12 story buildings planned for downtown San Francisco will be completely air conditioned, and it appears that there will be a market for commercial air conditioning in our major office buildings from now on," according to O. E. Doerr, vice president of Pacific Gas and Electric.

- *The Seattle* Dept. of Lighting reported that air conditioning installations totaling 519 hp had been made through September 30, 1956. Installations totaling 428 hp were the tops for all of 1955.

The department added, "Although the Seattle area seldom experiences excessive summer temperatures, there are many cases where the internal heat load of a building makes air conditioning mandatory.

- *In New York*, Arthur C. Ford, City commissioner of water supply, gas, and electricity, reported that there were 18,527 water cooled air conditioning units, totaling 275,218 tons of capacity in Manhattan at the end of 1955. Of the 275,218 tons, 230,942 were used with water conservation devices such as cooling towers, resulting in substantial savings.

Eugene O. Bauman, chief of the department's bureau of water register, said the trend in the city's larger office buildings, hotels, and other commercial establishments apparently is away from window units toward well engineered central systems with water conservation devices.

Present policy of the department is to enlarge all existing 6 in. and 8 in. mains in its gridiron distribution system to a minimum size of 12 in.

Department regulations provide that all systems of air conditioning in excess of 6 tons be equipped with a water conserving device.

- *In the Baltimore area*, air conditioning installations ran about 50 percent greater for 1956 than for 1955, according to the Baltimore Gas and Electric Co. It said the estimate was based on its records of horsepower installed in air conditioning installations for the first 10 months of 1956.

GREAT WESTERN SAVINGS

IN LOS ANGELES, this striking new structure with 22 zones of controlled indoor environment, symbolizes the long standing general acceptance of air conditioning in this area. Now air conditioning installations are showing a sharp increase in the mild climates of northern and central California

In 1955 there were 862 air conditioning istallations totaling 18,572 hp. This compared with 848 installations totaling 22,700 hp in 1954. The total of such installations, as of December 31, 1955, was 6250 with 137,304 hp. These figures did not include window air conditioners.

Selfcontained room cooler unit sales were: 1955 — 14,884 units, 13,476 hp; 1954 — 10,175 units, 8581 hp; total as of December 31, 1955 — 50,855 units, 41,441 hp.

A 140 percent increase in air conditioning tonnage installations in the Pittsburgh area by 1965 is forecast by the Duquesne Light Co. It reported that there were 87,500 tons of air conditioning capacity on its lines, in Allegheny and Beaver counties.

Of this total, 600 units totaling 65,00 tons were installed in commercial establishments such as stores, offices, theaters, and institutional buildings. About 13,500 tons were installed in residences. Installations of various sizes in industrial plants totaled 9000 tons.

The company forecasts that 125,000 tons of additional air conditioning capacity will be installed by 1965.

- *In the Midwest*, the report from Chicago was typical. Here a big increase in air conditioning installations was predicted.

The Chicago Dept. of Water and Sewers estimated that through 1955 there were 255,000 tons of water cooled air conditioning capacity in operation in Chicago. Commissioner James W. Jardine said that estimates of 560,000 tons of water cooled air conditioning in operation are forecast by 1960 and that plans now are under study for controlling water consumption by requiring use of conservation devices.

- *In the South*, conditions are indicated by studying typical reports from Houston and New Orleans.

In Houston, a steady increase in the installation of air conditioning equipment over the past few years was reported.

The Houston Lighting and Power Co. said 1955 installation figures included 1524 residential units totaling 6908 tons of air conditioning capacity, 944 commercial and industrial installations totaling 19,994 tons and 56,453 window units totaling 58,588 tons.

For 1954, comparable figures were 1213 residential installations totaling 5787 tons, 835 commercial and industrial installations totaling 18,718 tons, and 48,188 window units totaling 45,279 tons.

Increases have been noted in all types of installations since 1946, the company reported, except that capacity of new commercial and industrial air conditioning installations went from 12,668 tons in 1949 to 9430 in 1950. The number of such installations went from 334 to 421 in those two years.

New Orleans Public Service, Inc., through general sales manager E. N. Avegno, reported that commercial and industrial air conditioning installations made in 1955 totaled 4200 tons of capacity, as compared with 3370 tons for 1954 and 1545 tons for 1953. ‡

How to Increase Efficiency Of Plant Piping Systems

Efficiency of an industrial piping system requires correct design, including proper selection of equipment and materials. Provision must also be made for the special problems of corrosion, expansion, vibration and for adequate trapping and drainage. In addition, the properly designed and well maintained piping system will reflect these conditions in overall cleanliness and in color coded painted surfaces, not merely for neatness but for greater efficiency and economy.

BY ROBERT J. PINSKE

12. Choose Proper Corrosion Resistant Materials

THE CORROSIVE ACTION of certain fluids, is perhaps, the largest single factor in high piping costs. It is not only responsible for untimely deterioration, but it is a constant threat to the quality of the manufactured product, and in some cases it even endangers human life.

While corrosive conditions exist mainly in lines handling process fluids, they also are frequently troublesome in lines handling common fluids. In surveying 117 industrial plants, the author observed some unnecessary cases of corrosive effect on valves in common services, such as water, steam, condensate, and oil piping that are usually controlled by the proper use of valve trim metals.

Naturally, severe cases of corrosive conditions require special consideration. The judicious use of the proper valve trim materials will, in a large number of cases, be far more economical than a complete valve of a special corrosive resisting alloy.

No one metal will successfully resist corrosion by all of the fluids encountered in the industrial plant of today, especially the food and chemical process industries. However, any evaluation necessarily involves a comparison between metals, with respect to any individual set of service conditions. Such a comparison does not depend upon inflexible rules of behavior, but depends upon some general indications as to the probable behavior of any metal or alloy in any given situation.

While the evaluation of corrosion resisting materials depends upon comparisons between them, it also depends upon comparisons of them with other materials. Considerable use will always be made of metals and alloys which are not characterized by a high order of resistance to corrosion, but which are moderate in cost and with which plant engineers and maintenance pipe fitters have acquired an extensive background of experience.

13. Calculate Expansion Correctly and Safely

AN EXPANSION CONNECTION may "freeze" into a fixed position. This frequently happens if the piping is not properly guided to the makeup connection. Such a condition, if neglected, may lead to very serious breaks in the pipe lines, plant shutdown, fatal accidents, and great damage to equipment and buildings. To guard against this dangerous condition, it is necessary periodically to inspect every expansion connection carefully to see whether it is binding or cramping. The stuffing boxes should be examined for leaks, and wherever practical, a permanent expansion pipe bend should be substituted.

A 100 ft section of carbon steel pipe at 70 F will expand $2\frac{3}{4}$ in. when the temperature is increased to 400 F. When the temperature of the same pipe is increased to 1000 F, the pipe expands $8\frac{3}{4}$ in. The expansion must be absorbed with some form of compensating device, or serious damage will result.

Loop pipe bends are the most

The author is sales manager, heating and industrial division, Warren Barr Supply Co.

Previous articles by Mr. Pinske on industrial piping maintenance have been published in the November and December 1956 *and January, February, and March* 1957 *HPAC's.*

common device in use. These are adequate for most jobs, but there are piping systems in which some form of expansion connection may be better. The choice will depend on the amount of expansion, the necessary area around the pipe bend, cost of the pipe bend, and the cost of the expansion connection.

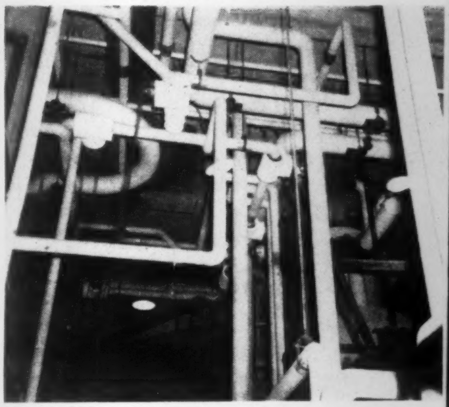
If bends are used to take up this expansion, the total length of piping is increased, which thus increases the total expansion to be cared for as well as the first cost of the piping. Loops or bends are good above ground and where there is enough space for them. Little maintenance is needed, but they are expensive to form and install, especially in larger sizes.

As an alternative to piping bends, a piston type slip connection or a bellows type unit of copper corrugations may be used to handle the expansion. Working pressures of the latter are limited to low pressure piping.

A corrugated connection is a bellows or accordion type section that flexes as pipe expands or contracts. Needing little space and maintenance, it is best where temperature changes are infrequent because then there is less flexing.

Slip connections have a sleeve that slides in a body fitted with a stuffing box to prevent leakage. They are simple and durable. Less space is needed than for a loop, and initial and installation costs are lower, especially for large sizes. There is no danger of fatigue failure. Packing maintenance and lubrication of connection vary with service.

The fundamental requirement in the selection for flexibility is to calculate the amount of movement accurately and safely. No device or method will safely compensate for a system that is underestimated or bound in any way. Proper estimating means to evaluate also any possible movement from the equipment to which the piping is attached.



THERMAL DEFLECTION of piping in high pressure, high temperature applications requires flexible support

14. *Piping Supports Are "Most Neglected"*

The anchors and supports of all piping are an important factor in the piping maintenance of an industrial plant. Too often they are the most neglected components of a plant piping system. As a result, anchors and supports are responsible for a large percentage of the excessive and unnecessary costs of piping maintenance.

For example, if the piping supports become loose, the piping will sag, causing an improper pitch in steam and air lines which will prevent the condensate from being carried to its logical point of drainage. In water lines, improper pitch will cause pockets of air to form, create difficult drainage, and cause improper flow in the line itself. The buckling of anchors or hangers will eventually lead to leaks.

More serious consequences possible with a connection that will burst under pressure are injury to personnel, damaged machinery, interrupted production, and complete plant shutdown.

To ascertain these conditions is quite simple if a qualified piping inspector will make periodic inspections throughout the plant and check the following two items: 1) Inspect all piping for alignment and pitch, and evidence of movement of the anchors from their original position. 2) Inspect all hangers to see that each is carrying its portion of the load and the pipe is actually riding on the roll supports to permit the necessary movement of the pipe.

There are many types of piping hangers and supports available for the proper support, suspension, and anchoring of a piping system. Some of the most commonly used types are: adjustable clevis; band and ring hangers; pipe roll and sockets; clamps; pipe roller supports and stands; and the use of welded steel brackets.

Welding can be utilized advantageously for fabricating and attaching accessories to piping. These attachments, in turn, provide extremely useful adjuncts for the suspension or the support of many portions of piping systems. This suggestion is not intended to discredit the use or the value of pipe hangers. The bulk of piping is effectively suspended with hangers. The welded lugs are a supplementary device and are especially adaptable when curved sections of piping are involved.

15. *How to Diagnose and Correct Piping Vibration*

The vibration in piping may be caused by water hammer, pulsating loads, or it may be transmitted by the machinery to which it is connected. Whatever the cause, its effect is serious. The author has observed many instances where its neglect proved to be very costly by eventually destroying connections and valves. This neglect has even damaged the settings of boilers.

If vibration is caused by pulsating loads, it will frequently be corrected by the installation of receiver separators of adequate size and properly placed. In some cases, the installation of smaller size pipe lines will remedy the trouble.

Vibration due to water hammer in steam lines can be corrected by the introduction of a better system of drainage. In liquid lines, water hammer will usually be stopped by installing air chambers and vibration dampers. Periodic inspections will reveal vibration difficulties by observing the cracking of pipe covering and evidence of vibration cracks in the wall, around the supporting brackets.

When a complete analysis has been made of the plant piping system, management should then have a detailed picture of the exact condition of the piping equipment.

Once the piping system has been brought up to its peak operating condition, management must not take it for granted that it will stay that way.

To do so would be to cast aside the very benefits that management is seeking; namely, the consistent lower costs that result only from persistence in maintaining piping efficiency.

16. Color Code Piping System for Efficiency, Economy

To SIMPLIFY piping identification and to increase safety the American Standards Association recommends the following colors to be used in industrial plants: red for fire protection equipment; yellow or orange for dangerous materials; green for safe materials; bright blue for protective materials; and purple for extra valuable materials.

Depending on plant preference, the entire pipe may be painted the proper color, or bands 8 to 10 in. wide may be painted at regular intervals along the pipe. When bands do not fall near valves, pumps, tanks, filling connections, headers, and manifolds, additional bands should be added so there is no danger of errors being made during operation and repair of the piping system.

To further aid in piping identification, the name of the fluid handled should be stenciled on the exterior of the pipe wall or insulation. Where possible, the fluid name should be fully spelled out, but abbreviations may be used where needed.

As a guide in determining the proper classification for any liquid, the following breakdown may be used. Dangerous: combustible gases and oils, hot water and steam above atmospheric pressure. Safe: compressed air, cold water, and steam under vacuum.

Moist and acidic atmospheres may cause paints to fade or change color. Hence it is important that paint be properly chosen if these conditions are expected during plant operation. Sea air, saline drippings from underground tunnels, and fatty acids thrown from machinery destroy paints.

Painting also protects the insulation when the pipe lines and valves are insulated. The paint will act as a waterproofing agent and will prevent moisture and water from saturating the covering. The author observed many industrial plants where the insulation had become saturated with water and had completely fallen off, or was in the process of falling off. A tremendous amount of heat is wasted in this manner.

When a piping system is not identified, there will always be a great deal of unnecessary time spent in tracing lines and locating control valves, with the end result of increasing the cost of piping maintenance. In times of an emergency, failure to locate the proper pipe line or valve can be most serious, especially in a power plant.

Tagging infrequently used valves of any pipe line is a simple task. All industrial plant piping should have some permanent sort of identification mark placed on the most important valves and controls. ⧺

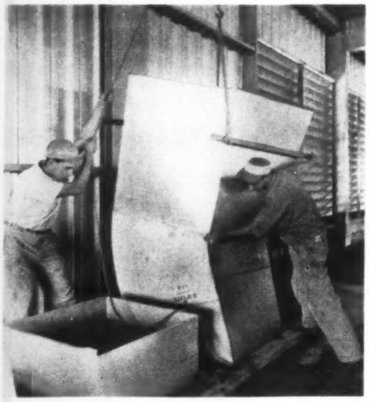
Other articles by the author on piping maintenance will be published in future issues of HPAC.

Install 9 Mi of Ductwork in New Ford Plant

. . . served by 24 big fans

NINE miles of ventilating ducts have been installed in the new Ford Motor plant at Lima, Ohio, according to The Wheeling Corrugating Co. Nearly 500 tons of sheets were required to form the 9 miles of ducts for the project.

Sections were formed in an assembly shed just to the west of the plant proper. Then as many as four individual duct sections were joined together with connectors and transported into the plant for installation.



The factory area has a tempered and filtered air system. It is served by 24 large ventilating fans in a common rooftop equipment room, 50 ft wide running the full length of the building.

The employees' facilities building is supplied with filtered, heated, and conditioned air which is distributed by rectangular, above ceiling ducts.

The administration building is conditioned by low velocity systems of above ceiling ductwork and air diffused through ceiling panels from low velocity modular vents.

An average of 85 men were employed on the ventilating duct project, and it took 30 weeks to complete the job.

The 888,000 sq ft engine plant will be in operation this year. ⧺

The Law and Your Profits

BY WILLIAM HURD HILLYER

Didn't Know His Own Name

. . . or so it seemed when this heating, piping, and air conditioning contractor, sued for breach of contract, was found to have used various forms of names during negotiations

GENERAL contractors Litt I. Gantt Co., sued heating, piping, and air conditioning subcontractor N. D. Fawlt and his surety, Planet Indemnity Corp., for damages caused by the subcontractor's failure to complete performance of his contract.

The Gantt firm had undertaken the construction of a government project near a power site. For the piping work, Fawlt had given Gantt a written bid of $6500, which Gantt told him was the lowest.

Upon being awarded the general contract Gantt notified Fawlt to that effect and requested him to enter into a subcontract. Dispute arose between the parties as to the extent of the piping work. When Fawlt refused to sign the subcontract until these differences were resolved, Gantt induced one of Fawlt's employees to do so and persuaded Fawlt himself to proceed with the job.

Fawlt's bid included the requirement that a $6500 bond be furnished. Although he went ahead with the task, he delayed giving the bond until he was ready for $2500 as payment on the contract. Gantt had already let him have $710.14 on account and refused to pay any more until the bond was furnished.

Accordingly, on August 6 — the government contract having been secured by Gantt Co. on May 5 preceding — the parties including the general contractor's attorney met with Fawlt in the office of the surety company's agent. A bond was prepared, signed, and presented to Gantt, who thereupon paid $2500 to Fawlt and the contract was continued.

The contract called for completion before November 22. Delays on the part of Fawlt were pointed out by government engineers. As a result, the Gantt Co. feared that completion of the contract would be delayed beyond the due date and would subject them to a $25 per day penalty. They urged Fawlt to work faster. Their uneasiness increased. Ultimately they canceled Fawlt's subcontract and secured another piping concern to complete the job.

Meanwhile, Planet Indemnity denied liability on its bond and refused to take over the contract. The lawsuit was brought by Gantt to secure judgment against Fawlt and enforce against the bonding company the liability for his delinquencies. Three points were raised:

1) Who was the subcontractor?

2) What was the contract between Gantt and that subcontractor?

3) Should the bond, which had been written to "United States of America" instead of "Gantt" be reformed to change the obligee?

As to the identity of the subcontractor, Fawlt admitted in court that he used various names or forms of names in his proceedings. There was no dispute that some sort of subcontract was entered into and was partially performed by the person known as "N. D. Fawlt." He claimed that he was operating as the president of a corporation, "The N. D. Fawlt Heating, Piping, and Air Conditioning Co." Proof of its incorporation was offered in evidence. That company was apparently still in existence when the bid was signed "N. D. Fawlt, president, Fawlt Heating, Piping, and Air Conditioning," although not on corporation stationery.

When Gantt prepared the agreement which he requested the subcontractor to sign, he made it out to "N. D. Fawlt," but it was signed by an employee as "N. D. Fawlt Heating, Piping, and Air Conditioning Co., by I. M. Weak." This signature — valid or not — was accepted by Gantt without question.

The first checks from contractor to subcontractor were made payable to "N. D. Fawlt." After the bond was given, the checks of $1500 were written to "N. D. Fawlt Heating Co." and the last check was payable to "N. D. Fawlt and the Sumbody Piping Co." The indemnity bond was originally written to the "N. D. Fawlt Co."

The defendant surety company claimed that no reformation of wording should be had because the company "intended to write the bond to the U. S. government," and that the mistake was not "mutual."

The court in conclusion saw reason for reforming the name of the principal on the bond, which should have been written "The N. D. Fawlt Heating, Piping, and Air Conditioning Co." instead of "The N. D. Fawlt Co."

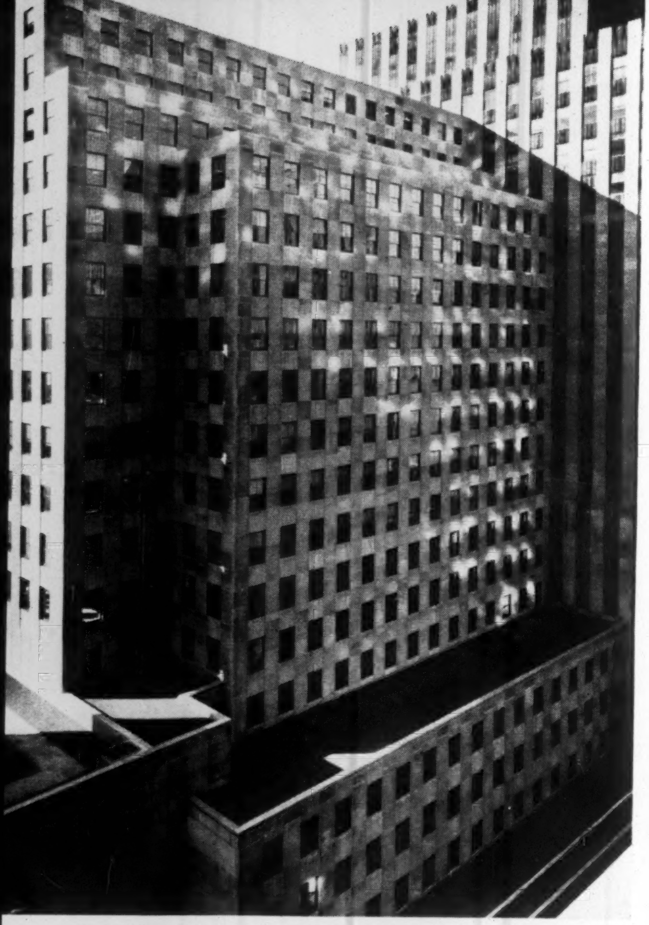
Judgment was rendered against N. D. Fawlt in favor of Litt E. Gantt Co. for $5929 as the amount in which Gantt had been damaged by reason of Fawlt's failure to carry out the contract.

WILLIAM HURD HILLYER, *author of this regular feature, is a contributor to a number of banking and financial publications and has written several books on business. He has an extensive practical legal and financial background.*

This series presents actual cases. Naturally, laws vary in different states. All names are fictitious.

Four Systems

BY LEWIS SMITH
Heating Engineer



1 ROCKEFELLER CENTER'S 15th building, new 19 story addition to U. S. Rubber Co. building, occupies site of former Center theater. All floors are continuous

WHY DOES a large modern office building use four different types of air conditioning systems? The U. S. Rubber Co. building at Rockefeller Center in New York City wasn't designed that way. It's partly the result of improvements in air conditioning methods during the 16 years from the start of this building to the completion of an $11 million addition in 1956. Also it's partly the result of the leasing practice of allowing large tenants some choice of air conditioning to suit their own requirements and preferences.

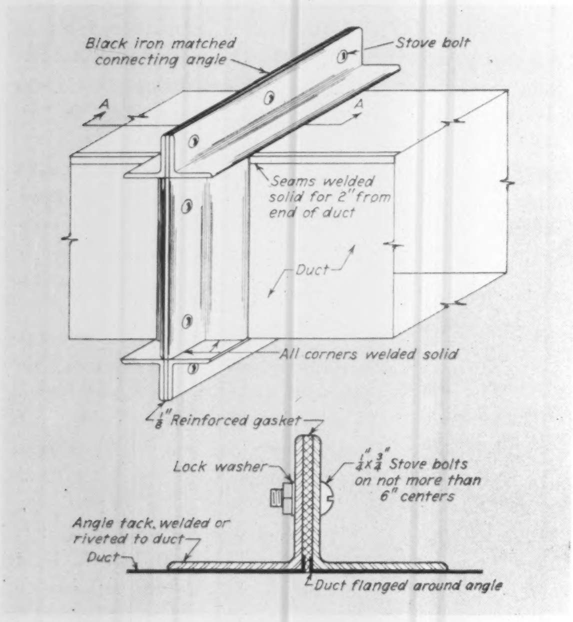
In 1940 a 20 story office building was completed on the Avenue of the Americas (Sixth Ave. at that time) at the southwest corner of the Rockefeller Center property, occupying the block front from 48th to 49th Sts., in front of and partly on top of the then existing Center theater. At first air conditioning was not included in the building plans. But after the frame had been erected, most of the space was taken by the U. S. Rubber Co., which requested air conditioning as part of the lease.

The most expedient way to do this under those conditions was to install equipment rooms on each floor, connected to low velocity duct systems furred into the ceilings. Chilled water was available from a large plant in the basement of the RCA building across the street. The heating system, of the subatmospheric control type similar to that used in the other buildings, with convectors under each window, was left as originally designed. This resulted in what is known as a split system of air conditioning.

As the U. S. Rubber Co. expanded its space and other tenants wanted air conditioning, the whole building finally was handled in the same way. If air conditioning had been included in the original design, a different method might have been adopted.

Use Round, Rectangular Ducts

A few years later it became apparent that the Center theater with its 3500 seats was not serving the purpose for which it was intended. At the same time there had been an increasing demand for office space in this area. So in 1954 the decision was made to demolish the theater and erect in its place a 19 story office building as an addition to the rear of the U. S. Rubber Co. building, forming a T, with all floors continuous through both buildings. Put together, these buildings provide 482,725 sq ft of net rentable area.


Black iron matched connecting angle
Stove bolt
A
A
Seams welded solid for 2" from end of duct
Duct
All corners welded solid
$\frac{1}{8}$" Reinforced gasket
Lock washer
$\frac{1}{4}$"x$\frac{3}{4}$" Stove bolts on not more than 6" centers
Angle tack, welded or riveted to duct
Duct
Duct flanged around angle

2 RECTANGULAR SHEET METAL DUCTS are joined with angle connection. Inside seams are painted with rubber cement to prevent air leaks due to high pressures

Condition U.S. Rubber Co. Building

- ***high velocity dual rectangular duct system serves some interior zones***
- ***high velocity round ducts serve perimeter induction units***
- ***"split" system has low velocity ducts in ceilings, convectors under windows***
- ***separate low velocity system conditions first floor***
- ***all use chilled water from plant in another building***

Because the floor heights in the addition were fixed to match the existing building, it was found that low velocity ducts to serve the greater interior areas could not be installed within the allowable head room. In addition there had been in the intervening years a considerable improvement in the use of high velocity and relatively high pressure systems with rectangular ducts.

Hence it was decided to put all the air conditioning equipment in two areas, one in the basement and the other on the eighth floor, and to use high velocity rectangular sheet metal risers to serve all floors. One set of risers goes up to the eighth floor, and the other set reaches from the ninth floor to the top floor.

For perimeter heating and cooling, a similar high pressure system with round ducts and with an induction unit under each window was selected. The ground floor, which has shops and banks, together with an exhibition area, has its own low velocity system.

Chilled water for the whole operation was obtained from the plant in the RCA building. This plant now has a capacity of 6400 tons of refrigeration, and the whole Center has 14,500 tons installed in the 15 buildings.

Tenant leases were based on open floors, finished and ready for occupancy. Air conditioning included the perimeter unit system for exterior spaces, and for interior spaces a single supply and return riser with furred-in ducts on each floor split into three sections for convenience in installation, each section equipped with a reheater coil controlled from a thermostat in the space served. As it worked out, there are only three tenants above the ground floor. One occupies the second floor, another from the third through the eighth floors, and a third from the ninth through the 19th floors.

Provide Variations in Control

The only provision in the basic plan for temperature control of individual spaces was the installation of hand valves on the heating and cooling coils of the perimeter units, whereby the tenant could throttle the water flow to the coils. Since it was felt that some tenants might want automatic temperature control by thermostats, pneumatic piping was included in the original construction so that the necessary valves could be installed later at a minimum cost.

The tenant leasing the third through the eighth floors also asked for automatic temperature control of all interior spaces. To explain why this request was made, it is necessary to revert to the space occupied by that tenant in the RCA building.

RCA Building Has "Ring" Ducts

The 70 story RCA building was completed in 1933. At that time air conditioning of commercial office buildings had been scarcely thought of. In later years, however, it became necessary to consider what could be done to air condition these older buildings.

Due to the shape of the RCA building — a thin rectangle with the long walls facing practically north and south — a "ring" duct system was devised. Each ring consists of a warm air duct, a cold air duct, and a return duct. These ducts are installed along the corridor ceilings as much as possible and furred in. The equipment rooms are at diagonally opposite locations. The cold and warm air ducts being continuous, the two air conditioning units assist each other as the sun and wind vary the requirements on the different exposures. In some cases these equipment rooms serve only the one floor on which they are located, but in most cases they serve two or three floors. Each individual outlet is fitted with a mixing damper controlled by a room thermostat to proportion the mixture of warm and cold air.

The existing convectors, left in place under the windows and supplied with subatmospheric steam controlled by the outside temperature, are relied on to supply the necessary heat in winter. But the dual duct systems are kept in operation in winter to provide for individual room temperature control as well as ventilation of the interior spaces. In addition, the dampers in the equipment rooms are arranged so that in spring and fall both ducts can supply all outdoor air to cool the spaces without having to resort to refrigeration to prevent overheating.

Choose Dual Duct System

The tenant who leased the third through the eighth floors in the U. S. Rubber Co. building addition, having been well satisfied with the dual duct system in his quarters in the RCA building, and having considerable interior areas, requested the use of the dual duct system in his new space.

This replaced the interior system with reheat coils originally proposed except for the second floor, where the warm and cold air risers are connected together to supply the interior system with a thermostatically operated mixing damper.

Overcome Leaky Duct Problems

High velocity air in rectangular sheet metal ducts is a development of recent years. Two principal problems had to be overcome. One was the design of outlets free from air noise, and in the case of dual duct systems the design of mixing dampers to operate properly. Both of these have been taken care of by the manufacturers of these parts. The second major problem has been making the ducts tight. With the higher pressures involved, a slight leak makes a whistling noise, which can be very objectionable, and of course the loss of air can be serious.

The contractor on the U. S. Rubber Co. building used a joint, as shown in Fig. 2. When tested with air pressure at 8 in. water gage, before furring in, a good many leaks were found. Application of many kinds of cement or tape from the outside was found ineffectual, so a number of openings had to be cut, and the leaky joints were painted from the inside with a rubber cement.

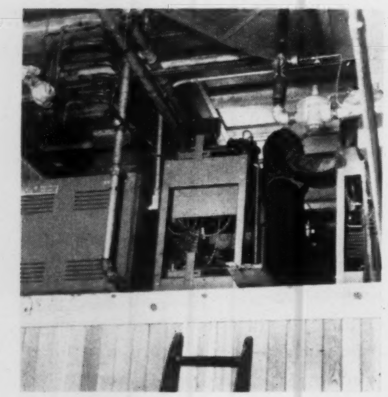
Other contractors have tried assembling the ducts in large sections in their shops, fully welded, and then welding these sections together after being put in place on the job. The question seems not to have been fully answered as to which way results in the lowest final installed cost.

The architects for the addition were Harrison and Abramovitz. Consulting mechanical engineers were Syska and Hennessy. Air conditioning contractors were Kerby Saunders, Inc. All are of New York City. ⌗

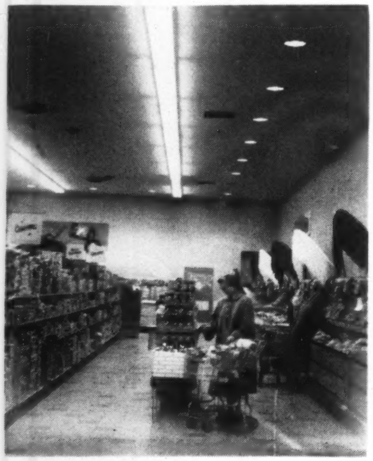
ON THE JOB

Two 25 Ton Package Units Condition Supermarket

. . . require no floor space



PLATFORM installation above walk-in cooler is in rear stock area



CEILING DIFFUSERS supply conditioned air to selling area

THE TWO 25 ton package air conditioning units serving the new Waldbaum supermarket in Belle Harbor, L.I., N.Y., occupy no valuable floor space, according to the Typhoon Air Conditioning Co. The units are installed on a steel platform above the store's walk-in cooler.

The units are equipped with heating coils totaling 700,000 Btu per hr in capacity.

Each low side unit was reworked for horizontal rear discharge and coupled with a 45,000 Btu per hr duct heater suspended from the ceiling in one section of the rear stock and work area.

All heating and air conditioning thermostats and switches are in the store office in the main selling area. All electrical controls, magnetic starters, and line switches are installed remotely on a panel centrally located between the two units.

Conditioned air is delivered to the 102 × 114 ft × 15 ft high selling area through ceiling diffusers. ⌗

Packaged Generators Heat New Air Terminal

. . . water circulates at 75 psi

Two gas fired 125 hp packaged hot water generators provide automatic heating for the new $5 million air passenger terminal at the Cleveland Hopkins airport, according to York-Shipley, Inc.

A uniform, thermostatically controlled temperature is maintained throughout the 166,000 sq ft of the building by circulating water at a pressure of 75 psi, permitting the hot water to be circulated to the 90 ft control tower, highest point of the heating system.

The two packaged generators are equipped with the latest combustion controls and full modulation. As the demand for heat falls off, the rate of firing is decreased until low fire is reached. If even low fire is too much, the generators will shut down. When the temperature of the circulated water has dropped to a predetermined low, the generators start up.

Consulting engineers were John Paul Jones, Cary and Millar. The heating contractor was James J. McHale. ⌗

Tear out along this line

How to Apply Semi-Rigid Duct Insulation

VAPOR BARRIER duct insulation is being secured here with speed clips. When the joints are sealed, the vapor barrier will prevent damage from condensation. This air conditioning duct is between the roof and ceiling

. . . *for heating and air conditioning systems*

BY J. L. MOHUN
Industrial Products Div.
Baldwin-Hill Co.

SEMI-RIGID, spun mineral wool duct insulation is suitable for heated surfaces at temperatures up to 400 F. It is available in three forms: (1) plain; (2) with a factory applied vapor barrier; (3) or with a neoprene coating. Vapor barrier duct insulation, covered on one side with a heavy black kraft paper coated with asphalt, is not recommended at temperatures above 150 F.

Standard sizes are 2 × 4 ft panels, ranging in thickness from ¾ to 2 in. The material has a nominal density of 7 lb per cu ft.

Surfaces must be free of loose rust, scale, or dirt. Before applying adhesive or before welding mechanical fasteners to sheet metal surfaces, remove all oil, grease, paint, or other coatings that might interfere with bonding.

Illustrated on the next page are five methods of applying the insulation.

How to Finish Insulation

Duct insulation may be left unfinished or may be finished with canvas, asbestos paper, insulating-finishing cement, paint, or weatherproofing compounds.

To finish with canvas or asbestos paper, use a cement designed for the purpose to adhere 6 or 8 oz canvas or 12 lb asbestos paper to the insulated duct. To further improve appearance and provide sharp, square corners, bend 26 or 28 gage galvanized metal or thin aluminum around all corners.

To be finished with white mineral wool insulating-finishing cement, the duct insulation must be impaled over welding pins or other mechanical fasteners which are approximately ½ in. longer than the insulation thickness. After the semi-rigid material has been secured with clips, apply wire mesh or metal lath over all four surfaces and tie corner bead to all edges. Secure the lath or mesh on the same fasteners holding the duct insulation. Apply a minimum thickness of ⅜ in. of white mineral wool insulating-finishing cement to the surface and trowel smooth.

Paint the insulation with a rubber base paint.

On outdoor ducts, first finish duct insulation with white mineral wool insulating-finishing cement. After the cement has dried thoroughly, apply a tack coat of asphaltic mastic, using 4 gal per 100 sq ft. While the mastic is still wet or tacky, press a layer of woven glass cloth into it and then spray on a final coat of mastic.

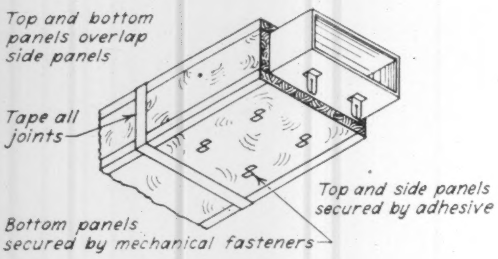
TABLE 1—THERMAL CONDUCTIVITY in Btu's, in. per hr, sq ft, deg F is shown here for one type of semi-rigid mineral wool duct insulation

Mean temperature, F	Thermal conductivity, Btu's per in. per hr per sq ft per F
0	0.21
25	0.22
50	0.23
75	0.24
100	0.25
200	0.29

TABLE 2—SOUND ABSORPTION COEFFICIENTS of one type of semi-rigid mineral wool duct insulation are shown here, based on 1 in. thickness applied to duct interior

Cycles per second	Sound absorption coefficient
125	0.32
250	0.58
500	0.70
1000	0.93
2000	0.95
NRC*	0.80

*Noise reduction coefficient recommended by the Acoustical Materials Association. Actually it is an average of the coefficients at 250, 500, 1000, and 2000 cycles per sec.


Top and bottom panels overlap side panels
Tape all joints
Top and side panels secured by adhesive
Bottom panels secured by mechanical fasteners

1 ONE ECONOMICAL METHOD of application uses adhesive, clips, and tape.

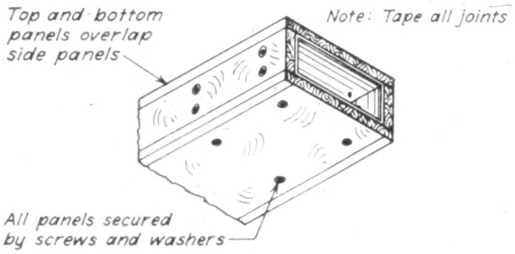
Apply welding pins or mechanical clips (using recommended adhesive) to under surfaces of horizontal runs and on all four sides of vertical ducts. Use at least one fastener per 2 sq ft of surface. Apply adhesive in 4 in. wide strips at 1 ft intervals to other three sides of horizontal runs.

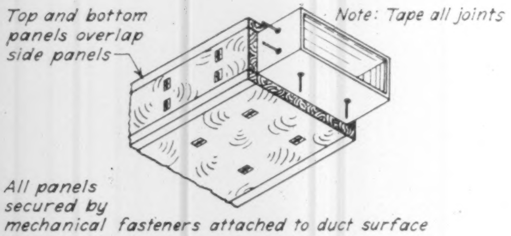
Cut duct insulation in widths and lengths to conform to duct surfaces. Cut top and bottom pieces to overlap side pieces. Cut side pieces slightly oversize to insure snug fit.

Apply bottom piece first, impaling it on the pins or clips and securing it either with washers or speed nuts or by bending the fasteners.

---

2 USE SHEET METAL SCREWS to apply insulation to light gage metal ducts of large cross section when projection of the screws into the duct is permissible. Use No. 10 or 12 gage galvanized stainless steel screws and fiber or 1½ in. diam metal washers. Screws should be ½ in. longer than the thickness of insulation. Drill holes in duct to accommodate screws and fasten insulation with at least one screw and washer per each 2 sq ft of surface. Screws should be applied as near duct edges as possible for maximum support. When fastening, make sure each screw takes a firm hold. Cut, fit, and seal the insulation in the same manner as when fastened with clips and adhesive.

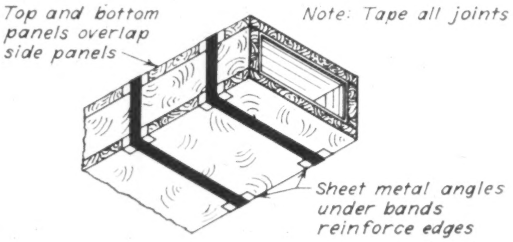

Top and bottom panels overlap side panels
Note: Tape all joints
All panels secured by screws and washers

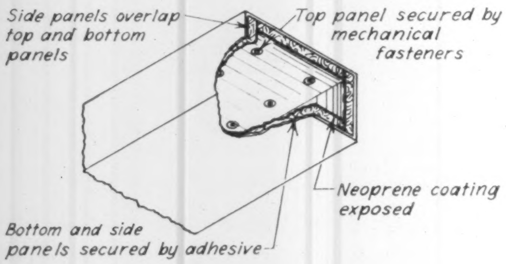

Top and bottom panels overlap side panels
Note: Tape all joints
All panels secured by mechanical fasteners attached to duct surface

3 USE PRE-ATTACHED PINS, WIRES, CLIPS, OR LUGS to insulate ducts of large cross section where penetration of the duct cannot be permitted. Attach pins, wires, lugs, or clips to all duct surfaces as specified for vertical ducts and horizontal under surfaces in the first method. Cut and fit the insulation as before. Impale panels on the fasteners, pressing them tight against the duct surface. Secure with speed clips or washers or simply bend the ends of the wires or lugs. Seal with proper tape as previously described. If a smooth finish is required, clip off any excess metal to leave an even surface.

---

4 BAND OR WIRES can be used on ducts up to a maximum width of 24 in. If used on wider ducts, mechanical fasteners are required to provide intermediate support on the bottom horizontal surfaces. Cut panels of insulation to fit, top and bottom panels overlapping side panels. Wrap circumferential bands or wires around duct loosely, and slide one course of insulation under them. Insert sheet metal angles at all four corners, and draw the band or wire tight, securing it with seals or ties. Use of adhesive to hold panels in place temporarily may facilitate application. Seal joints as before.


Top and bottom panels overlap side panels
Note: Tape all joints
Sheet metal angles under bands reinforce edges


Side panels overlap top and bottom panels
Top panel secured by mechanical fasteners
Neoprene coating exposed
Bottom and side panels secured by adhesive

5 INTERIOR APPLICATION of neoprene coated duct insulation reduces fan and turbulence noise. Cut insulation to fit inside the duct so that the side panels overlap the top and bottom pieces. Apply rubber adhesive to side and bottom surfaces in 4 in. strips on 12 in. spacing and ridge it with a serrated trowel. Press side and bottom pieces, coated side out, firmly in place to insure a good bond. Apply the top piece and secure it with pins, clips, or wires previously attached to the duct surface, or with screws and washers. Point all insulation joints with a fire retardant adhesive to insure tightness. ╪

The object of the Society is to advance the arts and sciences of heating, ventilating, cooling and air conditioning, and the allied arts and sciences, for the benefit of the general public, to encourage and conduct scientific research, and to cooperate with other organizations having the same or similar objectives.

Heating, Piping & Air Conditioning

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of the

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CONTENTS IN THIS SECTION

Report on the Annual Meeting 138
(President's Page) by P. B. GORDON

Evaluation of Four Methods for Determining Sound-Power Output of a Fan 139
(June Meeting paper) by W. F. KERKA

Performance of Intermittently-Fired Oil Furnaces 147
(June Meeting paper) by W. G. COLBORNE

1957 ASHAE GUIDE is Ready 151

Symposium on Dehumidification 152
(Papers I, III and IV as presented at this symposium at Society's Annual Meeting, Chicago, Feb. 26, 1957)

Make Reservations Promptly for Semi-Annual Meeting of Society 163
(Murray Bay Meeting, June 24-26, 1957)

Moisture in Heat Transmission through Building Materials 165
(Research Page) by N. B. HUTCHEON

Cleaning of Industrial Effluents 166
(Paper V presented at the Symposium on Industrial Ventilation at Annual Meeting, Chicago, Feb. 27, 1957)

Spring Regional Meetings Begin 167
(Region 2, Detroit, Mich., and Region 7, Ottawa, Ont.)

Activities of Society Chapters 169

Candidates for Membership 172

Obituaries 175

SOCIETY COMMITTEE ORGANIZATION

General Committees: The By-Laws provide for 9 such committees. The latest listing was included in January 1957 issue on pages 218-19

Research Committees: The research program is under the guidance of the Committee on Research — a General Committee. The Committee on Research appoints Technical Advisory Committees as needed. Latest list, with current membership, appeared in January 1957 issue 218-19

Special Committees: At present there are 9 of these committees. Latest list of them and of their personnel can be found in the January 1957 issue on page 219

Nominating Committee: This committee's membership is fixed by the By-Laws.

SOCIETY REGIONAL ORGANIZATION

Names of the Regional Directors and a list of members of the Chapters Regional Committees appears in this issue on page 176

SOCIETY CHAPTERS AND BRANCHES

The Society has chartered 67 Chapters, 1 Special Branch, and 6 Student Branches. These groups elect their officers and governing boards. A list of the presidents and secretaries appears in the February JOURNAL on pages .. 267-68

The President's Page

Report on the Annual Meeting

This issue of your *President's Page* is being written just after the close of the 63rd Annual Meeting of the Society in Chicago. If one word must be chosen to sum up my impressions of the entire week, this word could only be — BIG. My recollections of the 6 technical sessions, committee meetings and special events — the Exposition — the attendance at meetings and Exposition — as well as comments by many members, exhibitors and visitors — add up to an impression of greatness.

Many members attended one or more of the 34 scheduled committee meetings and possibly some of the informal committee meetings not on the program. Some attended meetings concerned with matters of official Society business such as finance, THE GUIDE, research, nominations and standards, while others attended meetings of Technical Advisory Committees concerned with the specialized technical subjects of interest to our Society and its research program.

The real measure of the success of any meeting of a technical society can be judged only by the total effect, resulting from the intermingling of the members and guests, their exchange of ideas, the stimulating of new programs, and the valuable discussions at the technical sessions, the symposiums and committee meetings. The true measure can never be evaluated but, undoubtedly, the effects on the Society and on the profession must be extremely valuable.

The Council Meets

The Council of the Society met twice. Many committees reported on their activities and many plans for the Society and its operations were discussed during these two meetings. A few agenda items of immediate interest are:

Honors and Awards: The responsibility of processing of proposals for HONORARY membership and for FELLOW grade has been assigned to the Honors and Awards Committee. The grade of FELLOW, which was established in 1956, implies honorary status for a MEMBER who has attained unusual professional distinction. This honor can only be conferred following a formal proposal. Proposals (on forms provided by the Executive Secretary) must set forth *in detail* the special qualifications of the MEMBER nominated for elevation to FELLOW grade. These proposals require the signature of ten (10) MEMBERS and twelve (12) members of Council. I would suggest that signed proposals be submitted to the Executive Secretary not later than the time of the Semi-Annual Meeting to provide the Honors and Awards Committee sufficient time to process the proposals before the Fall Council Meeting.

Standards: The Council approved a recommendation to restore the word *simultaneously* in the 1956 definition of air conditioning. It was agreed to include this word to strengthen the revised definition.

The Council also approved a recommendation to release the fourth draft of the proposed Standards for Comfort Air-Conditioning to the Society for its comment. This standard is the work of a Joint Committee (chairmanned by Walter L. Fleisher) that has been working on this problem for several years.

Reports were made on testing and rating codes having to do with such diverse equipment as: Boiler-Burner Units, Fans, Forced Circulation Air Coils, Roof Ventilators, Unit Ventilators, Vacuum Pumps, and Room Air Conditioners.

A committee has been formed to prepare a policy recommendation on the type of assistance that should be available to Chapters and members interested in working with local code-making groups. This activity is the outgrowth of a suggestion by the Regions Central Committee and of several Chapters Regional Committee meetings during 1956.

Meetings: Plans for future Society meetings were reviewed, with the details of the Murray Bay Meeting approved. Recent activities of the Program and Papers Committee and the Publication Committee indicate that good progress is being made in increasing the caliber and number of technical papers, and in stimulating interest on the part of the members through the medium of symposiums. Symposiums are being planned for future meetings on such subjects as: *Control of High Velocity Air-Conditioning Systems, Sound and Vibration, High Temperature Hot Water Heating, and Aircraft Air Conditioning.*

The Program and Papers Committee recommended that the Society should pursue an aggressive policy with respect to solicitation of papers and a more specific, flexible and realistic policy with respect to standards of content, approval, presentation and publication. This subject is under review by the Publication, Program and Papers, and Long-Range Planning Committees.

P. B. Gordon
President
AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS

Evaluation of Four Methods for Determining Sound-Power Output of a Fan

By W. F. Kerka*, Cleveland, Ohio

This paper is the result of research carried on by the American Society of Heating and Air-Conditioning Engineers at its Research Laboratory located at 7218 Euclid Ave., Cleveland 3, Ohio.

In the past, several methods have been employed for measuring equipment noise. In general, the methods have been based upon overall noise levels only, with little regard to the frequency distribution. In any noise-reduction problem, a knowledge of the frequency distribution, at least, by octave bands, is necessary for effective control.

The purpose of this investigation† was to evaluate 4 methods of determining acoustic-power output by octave-band analysis and to compare these 4 test methods only, not to correlate the acoustic-power output for different operating conditions of the fan.

To obtain suitable data for these purposes, measurements of acoustic power from a fan were made: (1) in a reverberant space; (2) in a free-field; (3) within the duct using an *anechoic termination* at the end; and (4) at the duct opening. These 4 sets of measurements comprise the 4 test methods referred to previously.

Results from these measurements are expressed here in watts of acoustic power in each octave band as this is an absolute unit of measurement. For ease of comparison the results have also been expressed on a power-level basis in decibels. Measurements of inlet and discharge noise were made at fan speeds of 1110 and 1340 rpm and at 2 system resistances for each speed. Test results for only 1 of these 4 operating conditions are shown in the paper.

SUMMARY—Four methods of determining the sound-power output of a fan by octave-band analysis were investigated. Measurements within the duct with an *anechoic termination* at the end were used for determining the sound power delivered by the fan to the duct system. The free-field and reverberant-room methods were employed in finding the sound power radiated into a space from the inlet and discharge ducts. The acoustic power in the space is dependent upon both the sound-power output of the fan and the size and location of the duct openings. The acoustic power at the duct opening was found from measurements made at the periphery, with and without air flow, and at the open face without flow.

In the 300 to 600 cps band and above, all of the methods correlate within 6 db. Measurements made within the duct indicate that the energy level within the duct in the lower frequencies is greater than that which is radiated from the duct opening. This is in accordance with theoretical findings[1]. Recommendations are made for adapting the test methods to other types of air-moving equipment.

Test Apparatus

A centrifugal fan was chosen as a noise source since it represents a common component of air-conditioning systems. The *fan installation* is shown in Fig. 1, and the 15-in. test duct extending 10 ft into the *reverberant room* is shown in Fig. 2. The centrifugal-type fan had 36 forward curved blades and a 15-in. wheel diameter. The duct system was designed with one end located in the upper Laboratory and the other terminating in the reverberant test room below. A 20-station Pitot tube traverse was employed for determining air-flow quantities. The fan and motor were mounted on a 1½-in. thick plywood sheet supported by 4 vibration isolators attached to a wooden base. The fan was isolated from the duct system by canvas couplings. The fan room, 14½ × 9 × 10½ ft high, was separated from the reverberant room by a sound-barrier wall. The *reverberant room* measured 30 × 26½ × 11 ft high. The volume was about 8900 cu ft and the surface area about 3050 sq ft.

For the *free-field tests,* the 15-in. centrifugal fan and the duct system were moved to a rear room of the Laboratory, where the 15-in. test duct was extended 10 ft through the rear wall into outdoor space and about 9 ft above ground level, as shown in Fig. 3. Tests were conducted during the summer when the weather was clear and the wind was at a minimum.

For measurements made within the test duct, an *anechoic termination,* exponential horn, and a round-to-square transition section were coupled to the duct. The termination was similar to the one described by Beranek et al.[2]

The standard-noise source used for calibrating the reverberant room was an industrial exhauster with modified housing, and a 5-blade, 18-in. diameter wheel as shown in Fig. 4. It gave sufficient sound power in all octave bands, with no corrections for background noise necessary.

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*Research Engineer, ASHAE Research Laboratory. Member of ASHAE.

†Conducted under the guidance of the Technical Advisory Committee on Sound and Vibration Control. Personnel: H. A. Lockhart, *chairman;* A. F. Hubbard, *vice chairman;* C. H. Allen, Sr., C. M. Ashley, A. E. DeSomma, Sidney Gordon, R. N. Hamme, H. C. Hardy, E. M. Herrmann, C. R. Hiers, F. B. Holgate, D. H. Krans, R. D. Lemmerman, R. D. Madison, R. E. Parker, T. A. Walters, R. J. Wells.

For presentation at the Semi-Annual Meeting of the American Society of Heating and Air-Conditioning Engineers, Murray Bay, Que., Canada, June 1957.

[1] Exponent numerals refer to References.

Journal Section

Acoustic measurements were made with a General Radio, Type 1551-A, sound-level meter coupled to a Scott, Type 420-A frequency analyzer used for octave-band analysis. The microphone was of the standard Rochelle-salt crystal type supplied with the sound-level meter. A 25-ft cable was used between the microphone and the meter. The reverberation time of the test room and the standing-wave patterns in the test duct were determined with a Bruel and Kjaer one-third octave-band analyzer, recorder, and condenser microphone.

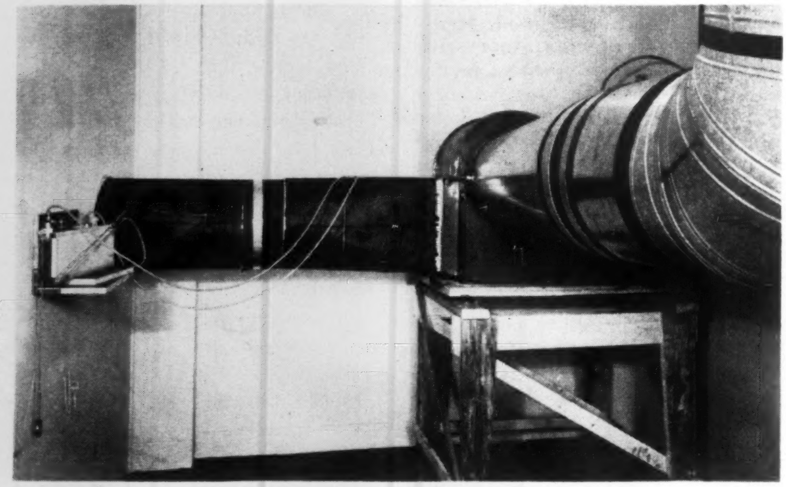

Fig. 1—Fan room installation

Test Procedure

Reverberant-Room Method: The room constants, which indicate the reverberant characteristics of a space, can be found by several methods.

In one method, the reverberation time for each octave band must be determined, and in another method the sound-pressure level in the reverberant field of a standard-noise source of a known acoustic output must be measured. Both techniques were employed to calibrate the room.

In the first method Equation 1[3] was used when the reverberation time for each octave had been determined by measuring the rate of decay of an impact noise.

$$R = (0.05V/T)\ [1 + (0.025V/TS)] \quad \ldots\ldots\ldots\ldots\ldots\ (1)$$

where

R = room constant, square feet.
V = volume, cubic feet.
S = surface area, square feet.
T = reverberation time, seconds.

In the second method, the acoustic power of the standard source must be known before the room can be calibrated. The acoustic power was determined by placing the source on a concrete apron in an outdoor space, and by integrating the incremental sound power over a hemispherical surface having a radius of 10 ft. The source was then placed on the floor of the reverberant room beneath the test duct opening. Octave-band readings were taken at 8 positions in the room at a minimum distance of 8 ft from the source and as far from any reflecting surface as space would permit. The microphone was always located midway between the floor and bottom of the ceiling beams. A mean of the readings in each octave band was used in Equation 2[4] to determine the room constants.

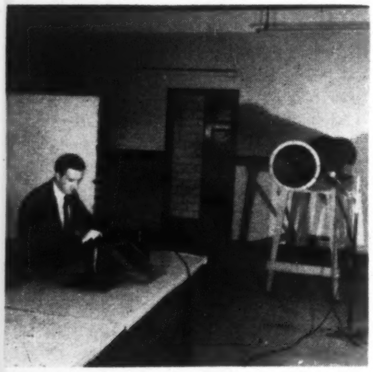

Fig. 2—The reverberant test room

$$R = W/[\text{antilog}_{10}\ [(SPL_R/10) - 13.65]] \quad \ldots\ldots\ldots\ldots\ (2)$$

where

W = acoustic power of the source (watts).
SPL_R = sound-pressure level in the reverberant field (decibels).

The acoustic power of the sound radiating from the inlet or discharge ducts of the fan into the reverberant space was then determined by again using Equation 2. In this case, W, the acoustic power, was the unknown.

Equation 2 as applied to the standard source can be combined with Equation 2 as applied to the unknown source with the resulting relationship identical to the one used by Bishop and Hardy[5]. The room constant is thus eliminated from the calculation.

Measurements within the Test Duct: To measure the acoustic power delivered by the fan to the inlet and discharge ducts of the fan, 2 difficulties are encountered. First, the pressure wave in the lower frequencies is reflected back toward the source from the open end.[1] To eliminate this, the pressure wave generated by the source must be completely absorbed by a termination. A perfectly absorbing termination is difficult to achieve, however. The second consideration is the self-generated noise that occurs whenever a microphone is placed in a moving air stream. To reduce this level sufficiently below the noise level being measured, a windscreen must be placed over the microphone. The windscreen used in this study was identical to the one described by Beranek.[2] The screen was in the shape of a cylinder, 3 in. dia. × 5 in. long, and made of 1/4 in. mesh hardware screen covered with parachute nylon having about 80 threads to 1 in.

The microphone and windscreen were located 12 in. from the end of the test duct. Readings were taken at the duct centerline and 2 in. from the centerline. Since the windscreen decreased the sensitivity of the microphone in the last 2 octave bands, a correction was applied. In addition, an orientation correction[4] was made in the last 3 octave bands since the centerline of the microphone was placed at right angles to the centerline of the duct. The acoustic power in the duct was determined from Equation 3, the derivation of which is shown in the Appendix. It is planned to publish the Appendix with the paper in 1957 TRANSACTIONS. Use of this equation is restricted to the assumption that the sound waves within the duct are plane waves. This is approximately the case[1].

$$W = 10^{-13} S \ [\text{antilog}_{10} \ (SPL/10)] \quad \ldots\ldots\ldots\ldots \quad (3)$$

where

S = cross-sectional area of the duct, square feet.
SPL = sound pressure level within the duct, decibels.

Free-Field Test: The acoustic power radiated from the open-end duct into a free space was determined by taking measurements at the center of 10 equal areas on each of 2 spherical surfaces shown in Fig. 5, one of 4-ft radius and one of 8-ft radius with their centers located at the duct opening. The following relationship was used.

$$W = 10^{-13} \Sigma \Delta S \ [\text{antilog}_{10} \ (SPL_s/10)] \quad \ldots\ldots\ldots\ldots \quad (4)$$

where

ΔS = area of each increment, square feet.
SPL_s = sound-pressure level at the center of each area, decibels.

The total acoustic power was found by adding the sound power in each incremental area. During all readings the windscreen was placed over the microphone, mainly to reduce the heat gain from the sun. Ambient air temperatures were constantly taken to determine the necessary corrections to the microphone readings.

During sound-level measurements at the discharge duct, it was necessary to make corrections to readings in the lower octave bands, for the one position along the duct centerline, in the wind stream. The readings at this position were high, and this was apparently due to the turbulent noise generated in the wind stream when acting as a jet[6].

The readings were corrected by taking octave-band measurements at 1, 2, 4, and 8 ft along the centerline to observe the 6 db drop that normally occurs with doubling of distance. At the 600-1200 cps band and above this was apparent while in the lower frequencies the readings generally increased or did not drop off as rapidly as theory would predict. In the first 4 bands at both 4 and 8 ft, the centerline readings were corrected by reducing them to the levels that would be expected with the 6 db drop-per-doubling effect. Although the corrected readings compared with readings taken just outside the airstream, it is recommended that this position be avoided. A plot of the directivity pattern for both inlet and discharge flow gave a fairly uniform pattern, with the readings in the higher frequencies at positions 6 through 10, somewhat lower than at positions 1 through 5 of Fig. 5.

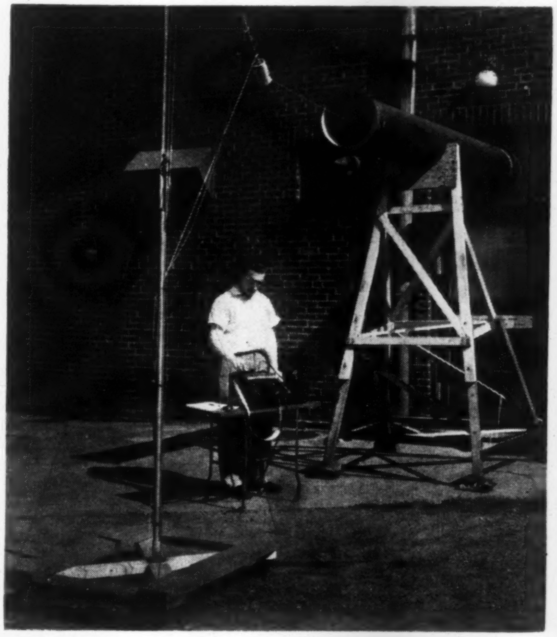

Fig. 3—Free-field test setup

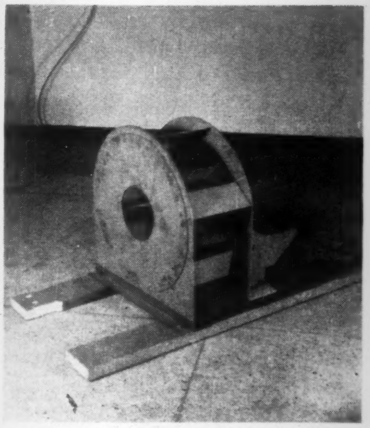

Fig. 4—The standard source

Duct-Opening Test: The duct-opening test is unique in that it does not require an elaborate test setup. Since measurements are made at the outlet, the exact characteristics of the room in which the test duct is located need not be known. Under no-flow conditions, sound-level readings were taken at 2 positions near the periphery of the duct opening (other end closed off) and at 2 positions on the face of the duct. The mean values of the octave-band readings taken at the face (each position of measurement being midway between the center of the duct opening and the periphery) were substituted in Equation 3 to determine the acoustic power at the duct opening for no flow.

Under flow conditions, readings were again taken at the periphery of the duct opening. For discharge studies, the edge of the microphone was placed about 1/4 in. from the peripheral edge of the 1½-in. angle around the opening as this was beyond the boundaries of the air stream. For inlet studies, however, the air motion at this location on the periphery was noticeable, hence the microphone was located 4 in. from the angle (for both flow and no-flow conditions) as shown in Fig. 2. The peripheral readings were taken on opposite sides of the opening.

The values obtained from the preceding measurements were substituted into Equation 5 to determine the acoustic power at the duct opening with flow. A derivation of this equation is shown in the Appendix.

$$W_{WF} = W_{NF} \text{ antilog}_{10} \left(SPL_{PWF} - SPL_{PNF}/10 \right) \quad \ldots\ldots\ldots (5)$$

where

W_{WF} = acoustic power across the open-duct face with flow (watts).
W_{NF} = acoustic power across the face at no-flow (watts).
SPL_{PWF} = sound-pressure level around the periphery with flow.
SPL_{PNF} = sound-pressure level around the periphery at no-flow.

Since no measurements were made in a moving airstream, the windscreen was not used.

Discussion of Results

Test results for one of the 4 operating conditions studied are shown in Figs. 6 and 7. At this condition the fan speed was maintained at 1110 rpm with an air delivery of 3600 cfm against a static pressure of 2.4 in. Fig. 6 compares the results of the 4 test methods in terms of watts of acoustic power (left-hand ordinate scale) for the discharge of the fan, and Fig. 7 compares the results of the methods on the inlet side.

To compare the results on an acoustic-watts basis only could be misleading to the layman, since one noise that has double the acoustic output of another would give only a 3 db higher reading. It should also be remembered that measurements of the same source with 2 different instruments could give differences of 2 db due to inherent instrumental errors. For convenience of comparison, therefore, the test results have also been expressed on a power-level basis in decibels for each octave band as indicated on the right-hand ordinate scales in Figs. 6 and 7. By definition

$$PWL = 10 \log_{10} (W/10^{-13}) \quad \ldots . (6)$$

where

PWL = power level (decibels).
10^{-13} = a reference base (watts).

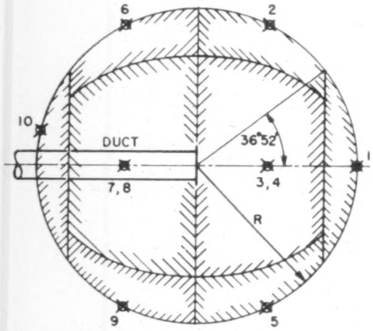

Fig. 5—Microphone positions used for free-field test method—positions are at center of incremental areas

Free-Field and Reverberant Room Methods: The free-field and reverberant-room methods measure the sound power radiated into the space in which the test duct is placed. The radiated acoustic power is dependent upon the acoustic output of the fan and the size and location of the duct opening. In most of the frequency range studied, the 2 methods show good agreement. Differences in the first band were probably due to 2 factors. First, it was difficult to measure accurately the background noise in the free-field test. Most of the background noise was concentrated in the first band and fluctuated between −12 and 0 db of the level being measured. The second factor was the uncertain effect of the reactive impedance of the reverberant room at low frequencies.[6] The differences in the last 2 bands (the free-field results being above those of the reverberant room) were probably due in part to the misorientation of the microphone during the free-field studies, or the error arising from the temperature correction. Correction for background noise was necessary only in the first 2 octave bands during the free-field studies. In the reverberant-room tests no background-noise correction was necessary.

The peaks at the 600-1200 cps band in Fig. 7 and at the 1200-2400 cps band in Fig. 6 result from the fundamental frequency and the harmonics of the fan blade impulses. This equals the rpm × number of blades/60 = 1110 × 36/60 = 666 cps, and multiples of this value.

While the free-field test is considered the fundamental method for measuring the acoustic power of equipment, it does require a large open space, (or anechoic chamber) free from reflecting surfaces and with a minimum of background noise. Numerous readings are necessary over the surface of measurement when the noise source has directional qualities. In the reverberant room, the noise source must be acoustically *small* compared to the room. The surfaces must be sufficiently hard to give a reverberant field within the dimensional limits of the space, and the geometry of the surfaces must be such as to diffuse the sound field and to minimize standing-wave patterns. A completely diffused field is difficult to achieve, hence numerous readings or a number of space-average measurements (obtained by swinging the microphone in a circle) may be necessary in order to obtain an accurate reading in the space. The standing-wave effect is greatest in the lower frequencies where the wavelength approaches the room dimensions. To show the fluctuations of sound levels in the space, the condenser microphone was swung on a 3-ft radius circle at 2 different locations in the room, and recordings with the one-third octave-band analyzer were taken at one-third octave-band center frequencies of 80, 160, 320, 640, and 1250 cps. The fluctuations in readings over the circle were 10, 5, 3, 2 and 0 db, respectively. These fluctuations as measured by octave-band filters would be of the order of 3, 2, and 1 db in the first 3 bands.

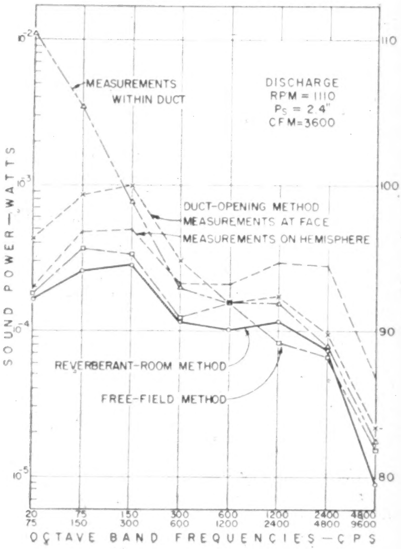

Fig. 6—Sound power vs frequency-discharge; power level vs frequency

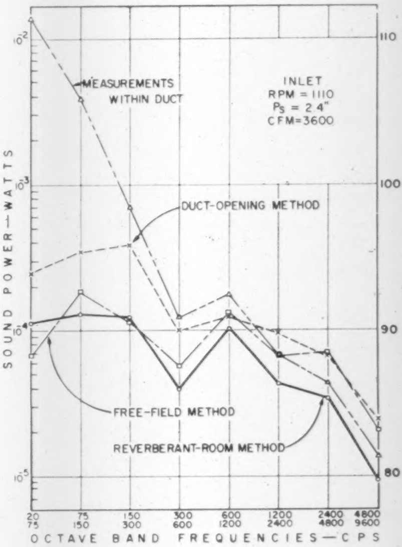

Fig. 7—Sound power vs frequency-inlet; power level vs frequency

The work to date indicates that the results obtained by the reverberant room method and by the free-field method might be expected to agree within ± 3 db.

Measurements within Test Duct: While measurements within the duct (with horn and termination in place) were made to determine the acoustic power delivered by the fan to the duct system, there are 2 schools of thought as to the exact significance of these readings. One school maintains that although at lower frequencies the energy level in the duct is greater than that radiated from the open end, because of the reflected sound waves resulting from the imperfections of the termination, the actual acoustic power generated by the fan (at either the inlet or discharge) is that which leaves the duct opening and is measured in the reverberant room or free field. The acoustic power must leave in this manner since the duct system is not able to absorb any reflected sound power.

The other school maintains, however, that the measurements within the duct actually indicate the acoustic power delivered by the fan to the duct system, and that the power level so determined would not be seriously affected by imperfections in the horn and termination at low frequencies. It is maintained that that portion of the acoustic power reflected from the open end is absorbed in both the inlet and discharge ducts of the fan. With the horn and termination in place, the reflected sound power is minimized.

In any case, it is evident that at lower frequencies the energy level within the duct is greater than that radiated from the open end. Whether it appears simply as stored energy or actual acoustic energy being delivered by the fan, it is nevertheless present and must be considered in the design of duct systems to ascertain the attenuation needed between the fan and outlet grille in an air-conditioned space.

Referring to Fig. 6 (discharge side) the differences between the in-duct method and the reverberant-room and free-field methods are in agreement with the theoretical end loss from an open duct.[7] In Fig. 7 (inlet side) the differences are from 3 to 6 db higher than theory would predict.[7] It is possible that the impedance of the duct opening is affected by the direction of air flow.

For measurements made within the duct, the microphone was located near the centerline since it was believed that this position would cause the least disturbance to the airstream and give the most reliable readings. A study of the transverse wave patterns, as described later in the paper, indicated a +2 db correction in the 300-600-cps band and a +3 db correction in the 600-1200-cps band in order to give average values existing across the entire section.

Whenever measurements are made in an airstream, it is necessary to know the self-generated noise characteristics of the windstream. Unfortunately no direct means were available for measuring the wind-noise. Since the windscreen was identical to the one used by Beranek, his data were extrapolated to the air velocities used in this study. The extrapolated results indicated that the self-generated noise levels were sufficiently below the level of the source that no corrections were necessary. Further comparisons were made with the findings of Van Niekerk,[8] which again indicated that the wind noise was no problem when measurements were taken inside the duct.

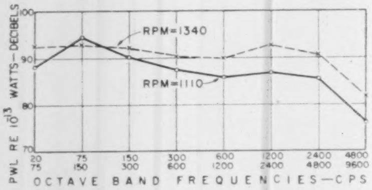

Fig. 8—Power level in fan room vs frequency

The Duct-Opening Method: Referring to Figs. 6 and 7, the duct-opening test gave results in the lower frequencies that fell between those obtained from measurements made within the duct and the results of the free-field and reverberant-room methods. The difficulty with the test is in making measurements across the duct opening at no flow. Because of the pronounced longitudinal standing-wave patterns along the centerline and extending beyond the opening, the choice of a location for the microphone was not evident. Moving the microphone along the duct centerline from a position slightly within the opening to a position slightly outside the opening gave average readings about equal to those at the face of the opening at 1250 cps and less. At 2500 cps and above, maximum readings occurred at the face. Readings were ultimately made at the face of the opening. The results would indicate however that acoustically the duct extended beyond its opening for about one-third to one-half of its diameter in the lower frequencies. Subsequent readings made on a hemispherical surface around the duct opening (with the assumption that this was the approximate acoustic end of the duct at lower frequencies) gave results in Fig. 6 that were more in line with the results of the free-field and reverberant-room methods at lower frequencies but somewhat higher at higher frequencies. It would appear that in this test method the readings at the duct opening at no flow should be made over the hemispherical surface (the radius of which equals the radius of the duct) in the first 4 octave bands and at the face of the duct in the last 4 bands.

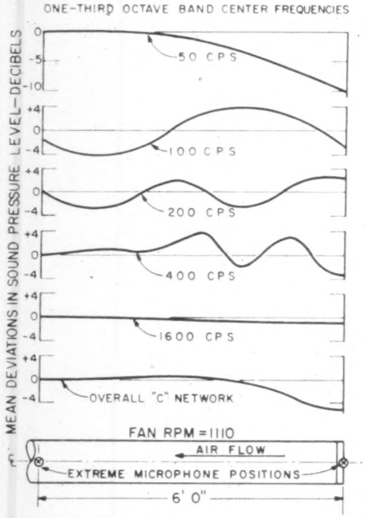

Fig. 9—Longitudinal standing waves along centerline of open-end duct

Comparison Tests: For one test the horn (without the termination) was placed on the end of the duct. Measurements in the reverberant field indicated that the acoustic power radiated to the space was greater by 4 to 5 db (on a power-level basis) in the first 3 octave bands than for the open-end duct. This is to be expected since the end reflection loss from the horn (26 × 26 in.) is less than the duct opening.

For another comparison the 10-ft test duct was removed and the acoustic power radiated from the short section of duct (the opening being flush with the fan-room wall) was determined. The sound power radiated from the short section was greater than that radiated from the test duct in the first, second, and last 3 octave bands. In the first and second bands differences of 5 and 3 db respectively (on a power-level basis) were noted. The greater differences result from the wall acting as an infinite baffle,[7] and more modes of vibration being excited in the room with the noise source at the wall rather than near the center of the room.

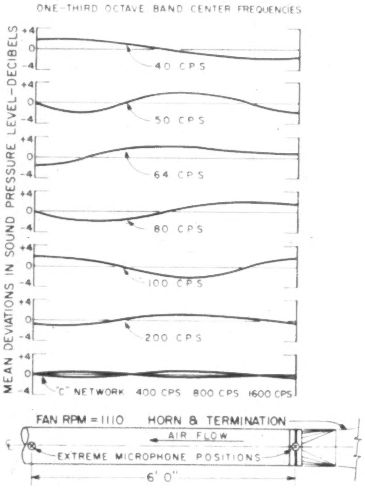

Fig. 10—Longitudinal standing waves along centerline of duct with horn and anechoic termination in place

Noise in the Fan Room

The sound power radiated from the fan casing, electric motor, and belt drive was measured in the fan room by the reverberant-room method using the standard source. The results on a power-level basis are shown in Fig. 8 for the two fan speeds. With the relatively small size of the fan room and the limited positions for measurement, the results are open to question, since insufficient modes would have been excited in the lower frequencies.

Standing Waves in Duct

Longitudinal Standing Waves: To determine the effectiveness of the exponential horn and *anechoic termination*, the longitudinal wave patterns along the duct centerline were determined with and without the termination in place. This was done by moving the microphone along a track through the length of duct as shown in Figs. 9 and 10. The windscreen was used over the microphone. The results of the wave patterns for the open-end duct are shown in Fig. 9. The wave form showed the greatest variations at the one-third octave band center frequencies of 400 cps and less, and negligible variations at 1600 to 5000 cps. At 640 to 1250 cps a transition was noted between the two extreme conditions. This would substantiate the fact that the duct becomes a less efficient radiator of acoustic power at the lower frequencies.

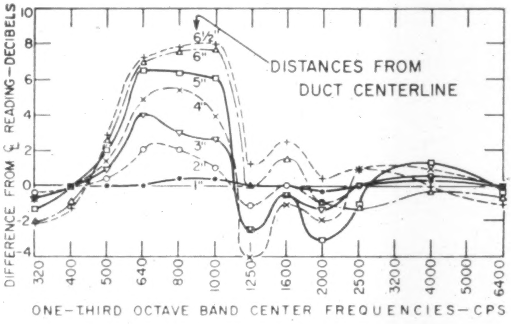

Fig. 11—Transverse standing-wave pattern in duct

The longitudinal wave patterns along the duct centerline with the horn and termination in place are shown in Fig. 10. Although the horn has a cutoff frequency of about 41 cps, it becomes a less efficient acoustic radiator at frequencies about an octave above this value.[9] This is shown by the wave patterns at 100, 64 and 50 cps, an indication that a portion of the pressure wave does not reach the termination but is reflected back toward the source. The termination itself becomes less effective at lower frequencies in absorbing acoustic energy. The wave patterns in Figs. 9 and 10 represent the mean readings of the fluctuations that were recorded. In other words, at any position along the duct centerline, the point-reading would fluctuate with time.

Transverse Standing Waves: At some frequencies the propagation of sound through a duct results in standing-wave patterns normal to the axis as well as in a longitudinal direction. The transverse waves were investigated by positioning the condenser microphone along a radial line outward from the duct centerline. A non-flow condition was used thus eliminating the windscreen. Measurements were made 18 in. inside the open-end duct. The variations relative to the centerline readings are shown in Fig. 11. The principal resonances occurred between 640 and 1000 cps. Measurements made at the centerline alone would therefore give a negative error of about 3 and 4 db in the 300-600 cps and 600-1200 cps octave bands, respectively. Measurements within the duct made at the centerline and 2 in. away resulted in a +2 and +3 db correction (or for the latter a doubling of the acoustic power in watts) for these 2 octave bands as previously indicated.

The Reverberant-Room Calibration

The room constants (square feet) are shown for each octave band in Fig. 12. The maximum difference between the values found from the reverberation time and those determined from the standard source is 30 percent. This would be comparable to an error of only 1.5 db which appears to be within the standard error of the instrumentation. The relationship of the room constant to the room area and the average absorption coefficient of the surfaces is given by Equation 7[4], thus

$$R = \alpha S / 1 - \alpha \quad \ldots\ldots\ldots (7)$$

where

S = surface area, square feet.
α = average absorption coefficient of the surfaces.

A room constant of 1000 sq ft in the first octave band (shown in Fig. 12) would correspond to an absorption coefficient of about 0.25. From the known properties of the surfaces this value is unusually high. This could result from the difficulty experienced in obtaining readable decay curves in the lower frequencies. The high value of the absorption coefficient determined from measurements made with the standard source could be attributed to gaps in the room response at low frequencies which are due to the small number of room harmonic modes.[9] As a result, some of the sound would not be transmitted to the microphone position in the room.

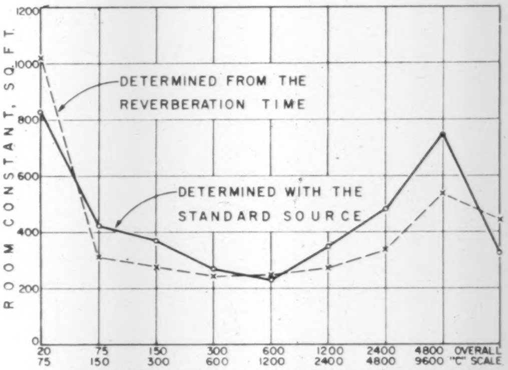

Fig. 12—Room constants for each octave band

The increasing values of the room constants (and hence higher absorption coefficients) above the 600 to 1200 cps band result from the increased sound absorption caused by the moisture in the room air.

Although the room constants can be in error in the lower frequencies, it should again be pointed out that this factor is eliminated in the use of Equation 2 for both the unknown and standard noise sources. The room constants have been presented, however, for the purpose of showing what one might expect to find through measurements for a room of this particular type and size.

Table 1—Methods Adapted To Determine the Acoustic-Power Output of Air-Moving Equipment

Type of Equipment	Test Method Recommended	Acoustic power Measured	Remarks
Unit Heater	Reverberant Room or Free-Field	The total acoustic power of the source is measured	The unit is self contained with no duct system
Axial Fan Without Duct	Reverberant Room or Free-Field	The total acoustic power of the source is measured	The unit is self contained with no duct system
Propeller Fan Without Duct	Reverberant Room or Free-Field	The total acoustic power of the source is measured	The unit is self contained with no duct system
Axial Fans and Centrifugal Fans with Duct System	Reverberant Room or Free-Field	For measuring the acoustic power radiated from the inlet and discharge ducts	The reverberant-room method could also be employed in determining the acoustic power radiated into the fan-room.
Axial Fans and Centrifugal Fans with Duct System	Measurements within duct	For measuring the acoustic energy within the duct	
Window Air Conditioner or Industrial roof exhauster	Reverberant Room or Free-Field	The acoustic power radiated from the outdoor and indoor sides would be measured separately	The unit should be placed in a wall as normally mounted. Free-Field measurements would be made over a hemispherical surface.
Self contained Unit air conditioner without ducts	Reverberant Room or Free-Field	The total acoustic power of the source is measured	Choice of method would depend upon size of unit as compared to the size and shape of test space

Note: The term free field, applies to either an unobstructed outdoor space or an anechoic chamber.

Application of the Test Methods to Other Equipment

The test methods studied could apply to other forms of air-moving equipment besides a centrifugal fan. Table 1 outlines the test methods most applicable for determining the acoustic output of various air-moving equipment.

Acknowledgment

The author wishes to thank the Brush Electronics Co. and the General Radio Co. for the loan of sound-measuring equipment.

General Discussion

No correlation between the sound power of the inlet and discharge ducts has been made. Whether more of the sound power is transmitted down the inlet duct than down the discharge (or vice versa) is probably a function of the fan wheel and housing configuration.

Acoustic output has been expressed in this paper as watts, since this is an absolute unit. Conversions can be made to a power-level basis when necessary for ease of comparison. When comparing data on a power-level basis the reference base must always be the same. Although the use of logarithms and anti-logarithms in the foregoing equations may appear bulky and awkward to solve, partial graphical solutions were constantly used which greatly simplified and speeded calculations.

There is still a great need for information that correlates the acoustic power output of equipment with its operating characteristics and dimensional configuration. When more of such data are available, the engineer will be able to predict and more accurately control the noise levels in air-conditioned spaces.

Conclusions

1. The reverberant-room test gives results that correlate well with the free-field test.

2. At lower frequencies, the acoustic energy in the duct is greater than that which is radiated from the open end.

3. Because of the transverse standing wave effect in the duct, measurements within the duct made at the centerline should be corrected if necessary in the bands where the resonant frequencies occur.

4. At least one, and in some cases two, of the test methods seem well adapted for determining the acoustic-power output of air-moving equipment as noted in Table 1.

5. While the duct-opening test does not require an elaborate setup, it needs further study before it can be applied as an accurate test method.

References

1. *Vibration and Sound,* 2nd Edition, by P. M. Morse (McGraw-Hill Book Co., Inc., 1948, pp. 233 and 246).

2. Apparatus and Procedures for Predicting Ventilation System Noise, by L. L. Beranek, J. L. Reynolds, and K. E. Wilson (*The Journal of the Acoustical Society of America,* Vol. 25, March 1953, p. 313).

3. *Handbook of Acoustic Noise Control,* Vol. 1, Physical Acoustics (Wright Air Development Center, December 1952, p. 79).

4. *Handbook of Noise Control,* by L. L. Beranek and A. P. Peterson (General Radio Co., 1954, pp. 7 and 77).

5. Evaluation of Equipment Noise, by H. C. Hardy and B. E. Bishop (ASHAE TRANSACTIONS, Vol. 62, 1956, p. 159).

6. Letter of Communication, by C. H. Allen (Bolt Beranek and Newman, Inc.).

7. HEATING, VENTILATING, AIR CONDITIONING GUIDE 1957, Chapter 40, Fig. 9, (published by AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, New York, N. Y.).

8. Measurement of the Noise of Ducted Fans, by C. G. Van Niekerk (*The Journal of the Acoustical Society of America,* Vol. 28, July 1956, p. 681).

9. Letter of Communication, by C. M. Ashley (Carrier Corporation).

Performance of Intermittently-Fired Oil Furnaces

By W. G. Colborne*, Kingston, Ont., Canada

Output of an oil-fired furnace is normally controlled by a thermostat which starts and stops the burner. For reduced outputs the burner operates for shorter on-periods relative to the off-periods. The actual length of the cycle will vary between different installations even for the same average hourly heat output.

In order to predict how a furnace will operate in an actual installation, a test which is run under intermittent-firing conditions will be more valuable than a test which is run under steady-state conditions. The purpose of this project is to investigate the performance of 2 standard warm air furnaces under various conditions of intermittent firing.

SUMMARY — Performance tests on warm air furnaces are normally run under steady-state conditions, that is, the readings and measurements are taken after temperatures and pressures have reached equilibrium. Warm air furnaces, however, are controlled in practical applications by a thermostat, and the resulting operation is intermittent. This paper presents the results of tests on 2 oil-fired warm air furnaces run under various conditions of intermittent operation. It shows that the performance under intermittent firing is different from that under continuous firing and discusses the factors causing the changes in performance.

Apparatus and Tests

The laboratory arrangement of ductwork, furnace and measuring equipment is shown schematically in Fig. 1. The Pitot tube and slope gauge were calibrated at the center of the throat section of the venturi. The calibration was made from a 20-point traverse, using a micromanometer for pressure measurements. The calibration curve was a plot of the average velocity at the 20 points against the velocity pressure reading at the center. The flow in cubic feet per minute and in pounds per hour could then be calculated.

Thermocouple grids were used to measure the temperature of the air entering and leaving the furnace. Each grid was made up of 12 thermocouples located in the centers of equal areas. In the case of the grid measuring the leaving air temperature, a mass-temperature traverse was made over the 12 points and compared to the value obtained by multiplying the measured total mass flow by the average temperature. The difference was less than 1 percent, which was considered to be sufficiently accurate.

The air temperatures were taken on a recording potentiometer. The oil burned was weighed on balance scales with an accuracy of 0.05 lb. The timing of the burner cycles was done by electric clock, and the burner was switched on and off by the operator.

The furnace selected for the initial study was an oil-fired conversion forced air unit of a *standard* design. The burner was a conventional high pressure gun-type. The furnace design referred to as *standard* consisted of an all welded steel drum with an attached crescent radiator. The radiator contained baffles which deflected the hot gases so as to make maximum use of the surface area as heat exchange surface. The furnace unit also contained the normal air circulating fan and filters.

The furnace selected for the second study was a single purpose oil-fired unit. This furnace was designed specifically for oil firing and was sold as a complete unit including the high pressure burner. The heat exchanger in this unit was also of a conventional design, *i.e.* an all welded steel drum with an attached radiator encircling the drum. The unit also contained fan and filters.

The conversion furnace had 23.7 sq ft of heating surface in the main drum, and the radiator contained 22.6 sq ft of heating surface, making a total of 46.3 sq ft. The main furnace drum was 24 in. in diameter. The grate area was originally 2.4 sq ft, and the output rating at the register was given as 111,000 Btu per hr.

The oil unit had a total heating surface area of 34.7 sq ft, the central drum having 8.1 sq ft and the radiator having 26.6 sq ft. The bonnet capacity was given as 112,000 Btu per hr. The diameter of the main drum was 14 in.

To simplify the test procedure, the fan which circulated the air to be heated was run continually. The weight flow of air was held constant during the test period. The temperature of the air entering the furnace was also held at a constant value. The temperature of the air leaving the furnace therefore varied.

The heat output of the furnace was calculated for each test, using the weight flow of air through the furnace and the average temperature rise of the air during the test period. The output was expressed in Btu per hour. The heat input was calculated from the weight of oil burned during the test and the heat content of the oil. The heat input was also expressed in Btu per hour. The bonnet efficiency which was calculated for each test was the ratio of heat output to the heat input.

The controllable variables were set and held constant during all tests as follows:

1. Air flow through the conversion furnace = 1000 cfm of standard air (density = 0.075 lb per cu ft).

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*Assistant Professor of Mechanical Engineering, Queen's University.

For presentation at the Semi-Annual Meeting of the American Society of Heating and Air-Conditioning Engineers, Murray Bay, Que., Canada, June 1957.

2. Air flow through the oil furnace = 825 cfm of standard air.
3. Smoke reading in flue gas = No. 1 set after 20 min of continuous operation.
4. Smoke pipe draft = 0.04 in. of water.
5. Conversion burner oil nozzle was a 1.5 gph with an 80 deg hollow spray cone.

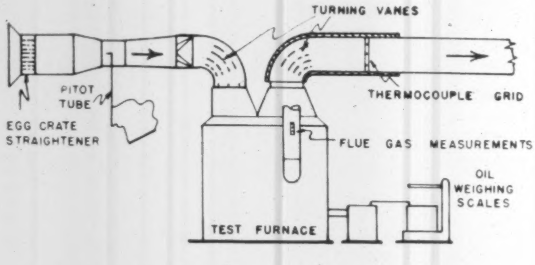

Fig. 1—Schematic diagram of testing equipment

6. Oil furnace burner nozzle was a 1.0 gph with a 90 deg solid spray cone.

Instrumentation was checked by making a heat balance during a steady-state test. The heat input was balanced against the heat output plus the flue gas loss, plus the casing loss. A check within 1 percent was obtained on this heat balance.

The conversion furnace was tested under various cycling conditions, the furnace being in the *as received* condition. The length of a cycle was varied from 5 min to 30 min in different tests, and the percent *on-time* per cycle was varied from 25 to 100. The air temperature curves for 2 tests at 40 percent *on-time* are shown in Fig. 2. The cycle length in the one case was 30 min, and in the other case, 5 min. The plot of bonnet efficiency against bonnet capacity is shown in Fig. 3, curve 1. It can be seen from this curve that the efficiency drops off as the percent of operating time decreases until a minimum efficiency is reached about 80,000 Btu per hr; then the efficiency begins to increase as the percent of operating time decreases further.

In order to investigate the reasons for the variation in efficiency in curve 1 certain conditions were changed as follows:

1. *Insulation*: It was noted that a high percentage of the casing loss from the conversion furnace occurred from the front panel which included the firing door. It was therefore decided to reduce the casing loss by insulating this front panel. Curve 4 of Fig. 3 shows the results in efficiency of applying this insulation. It should be noted that the efficiency under continuous operation was not changed by the addition of this front panel insulation.

2. *Regenerative*: The tests referred to as regenerative in Fig. 3 were run to study the effect of heat storage capacity within the furnace. It was apparent that the heat storage capacity would affect the temperature of the leaving air during cycling operation. Fig. 4 shows the effect on air temperature of this increase in heat storage capacity. Curve 2 in Fig. 3 shows how the efficiency was affected. The heat storage capacity of the furnace was increased by installing firebrick on a frame over the fire inside the main furnace drum. The conversion furnace was run with 12 standard firebrick arranged near the top of the drum. The oil furnace was run with 4 standard firebrick arranged over the fire. Fewer bricks were installed

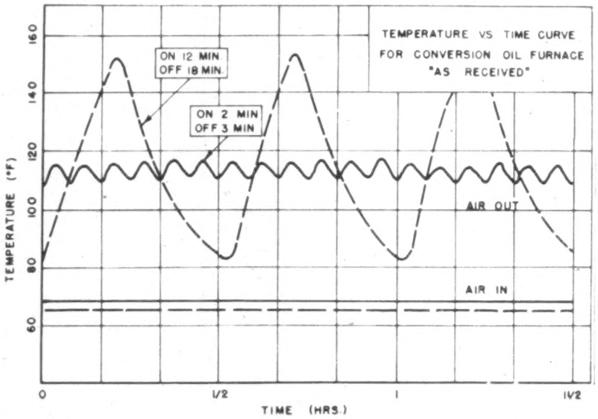

Fig. 2—Temperature-time curves at 40 percent on-time cycles with conversion furnace

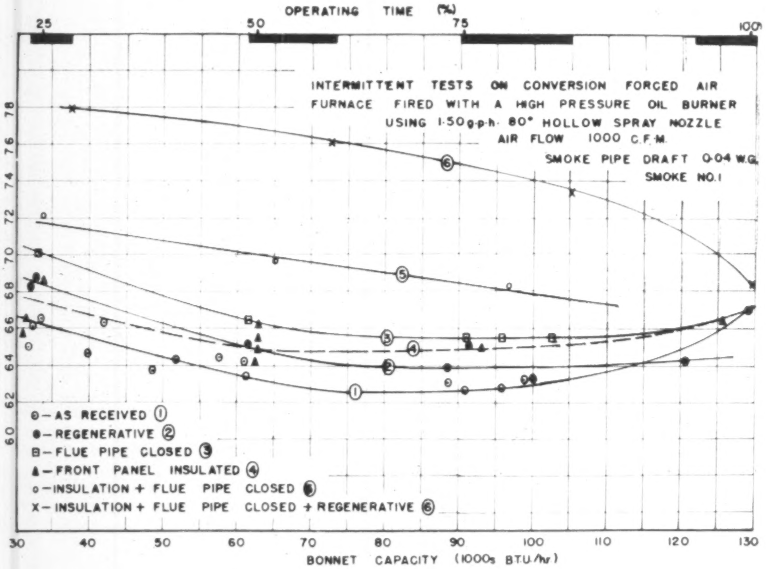

Fig. 3—Relation between bonnet efficiency and bonnet capacity with conversion furnace

in the oil unit due to the smaller space available.

3. *Flue Pipe Closed*: There was a loss of heat and hence a reduction in efficiency due to a flow of air from the smoke pipe during the off-period of the burner. In order to find the magnitude of this loss, tests were run in which the flue pipe was tightly closed during the burner off-periods. Curve 3, Fig. 3, shows the results of this test.

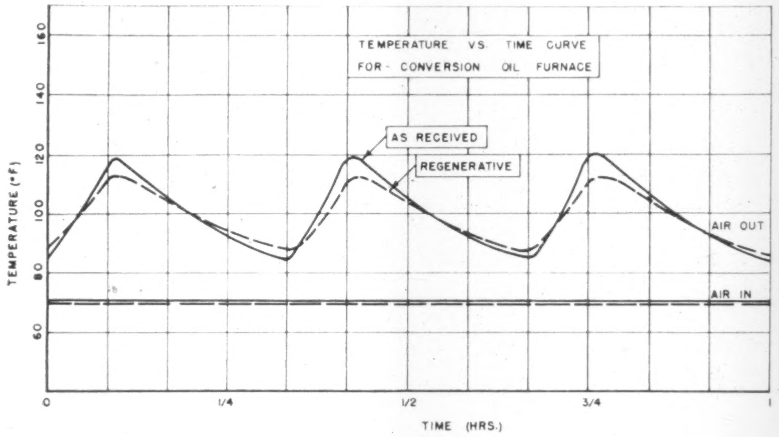

Fig. 4—Effect of increase of heat storage capacity on air temperatures out of conversion furnace

Curves 5 and 6, Fig. 3, show the effect on efficiency of 2 combinations of the foregoing conditions.

Fig. 5 is a plot of test results on the oil unit under various conditions of test. The cycle length was 20 min for all tests on the oil unit.

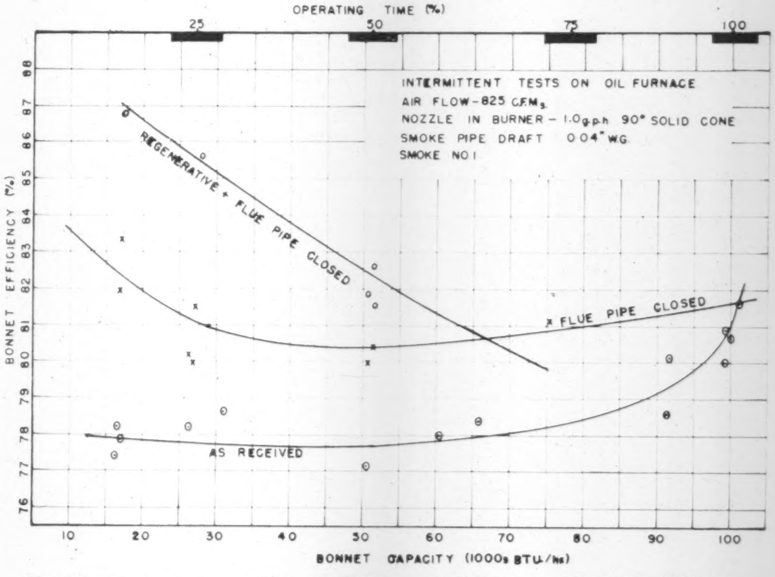

Fig. 5—Relation between bonnet efficiency and bonnet capacity with oil furnace

Discussion

The decrease in efficiency associated with cycling operation could be due to the following conditions: (a) inefficient combustion during ignition and shut-off (b) heat loss taking place during the off-period of the cycle. Since the efficiency was not affected by cycle length within the limits of these tests, the inefficient combustion during ignition would seem to be ruled out as a factor contributing to the drop in bonnet efficiency.

The heat loss taking place during the burner off-period could be broken down into casing loss and flue pipe loss. In order to show the effect of each of these losses, Curves 3 and 4, Fig. 3, were plotted. The insulation applied to the front panel did not eliminate the casing loss but only reduced it. The insulation and the closing of the flue pipe both reduced the drop in efficiency from the value found for continuous operation.

A test was then run combining the insulation and the closing of the flue pipe. The results are shown in Fig. 3, Curve 5. From the curve it can be concluded that heat losses from the furnace during the burner off-periods account for the reduction in efficiency below that of continuous operation.

Curve 5, however, indicates an efficiency increase as the operating time decreases from the point of continuous operation. This efficiency increase could only be caused by a storage of heat during the burner on-period and the release of this heat during the off-period. In order to prove this statement, the heat storage capacity of the furnace was increased as described previously. Curve 6 shows the result of this increase in heat storage capacity.

Results of the tests on the oil unit are shown in Fig. 5. The oil unit selected for this test is representative of high efficiency furnaces, whereas the conversion furnace represents a low efficiency group.

Conclusions

1. During intermittent burner operation, the bonnet efficiency was not affected by cycle length at any given percentage *on-time* of the burner. The range of cycle length was from 5 min to 30 min.

2. The efficiency of a warm air furnace under intermittent firing conditions was found to be different

from that under steady-state conditions. The difference was due to 3 factors, *viz*: (a) loss of heat from the casing of the furnace during the burner off-period, (b) loss of heat out the flue pipe during the burner off-period, (c) heat storage within the furnace during the burner on-period and the release of this heat during the off-period. Factors (a) and (b) reduce the efficiency, while factor (c) increases the efficiency. The combination of these 3 factors and the predominance of 1 over the others will determine whether the efficiency will increase or decrease under intermittent firing as compared to continuous firing operation.

APPENDIX

Analysis of Furnace Operation

Since performance characteristics have now been investigated for intermittent burner operation, an analysis of the conditions of actual operation would be useful.

Weather data from a Department of Transport weather station were compiled for 4 heating seasons, at Kingston, Canada. These data are plotted in Fig. A-1. The base axis, indoor-outdoor temperature difference, was based on an indoor temperature of 70 F. The vertical axis was the number of days in the period considered, expressed as a percent, that each indoor-outdoor difference occurred.

Fig. A-2 is a plot of running time of a burner against the indoor-outdoor temperature difference. The theoretical curve shown assumes 100 percent on-time, or continuous operation, at −10 F, which is the design temperature in use at Kingston, Canada. The actual operation line was obtained from a University of Illinois Bulletin[1] describing the study of an oil furnace in actual use in a residence. The winter design temperature at Urbana, Ill., is also −10 F.

The curves of Figs. A-1 and A-2 were combined to yield a plot given in Fig. A-3. This figure shows the number of days in the heating season as a percent, plotted against the percent operating time per cycle of the burner. It can be shown, using the actual curve from Fig. A-3, that approximately 70 percent of the time during the heating season the burner operates with an on-time per cycle between 15 and 35 percent.

This analysis gives information about the operating time of a burner when used in an actual residence. It also becomes evident that furnace performance should be considered under conditions of intermittent operation and in particular in the region of 25 to 40 percent on-time per cycle.

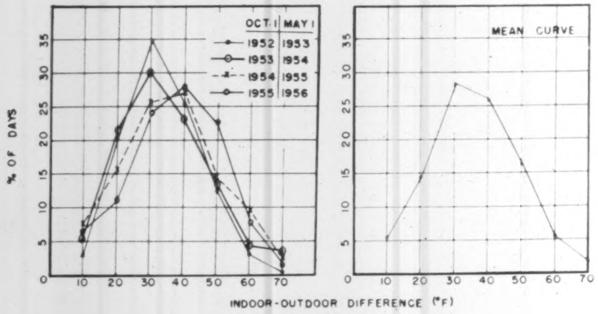

Fig. A-1—Weather data for Kingston, Ont., Canada, determined from Department of Transport weather station

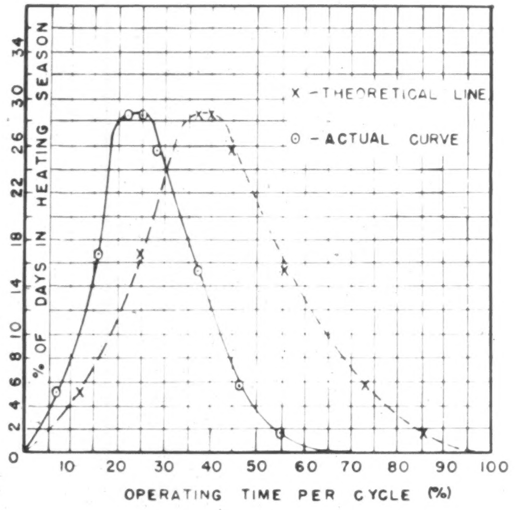

Fig. A-3—Relation between percent days in heating season and percent operating time per cycle based on curves of Figs. A-1 and A-2

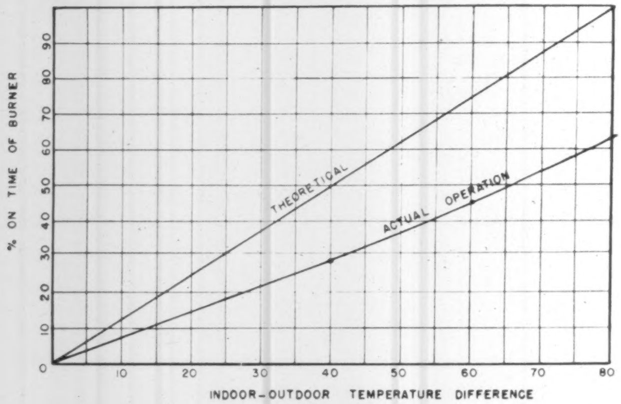

Fig. A-2—Relation between operating time of burner and indoor-outdoor temperature difference. Theoretical curve assumes 100 percent on time at outdoor temperature of −10 F while actual curve was from tests conducted in a residence

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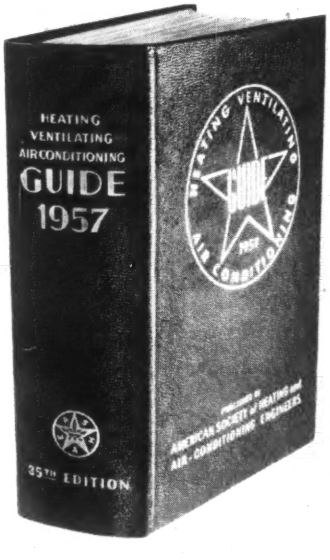
[1] Investigation of Oil-Fired, Forced Air Furnace Systems in the Research Residence, by A. P. Kratz and S. Konzo (*University of Illinois Bulletin, November 7, 1939*).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[HEATING VENTILATING AIR CONDITIONING GUIDE, 1957, *35th Edition, 6 x 9 in., blue cloth bound, gold stamped,* AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, 62 *Worth St., New York* 13, *N. Y., single copy price* $12.00]

As has been the case in recent editions, the current edition of THE GUIDE appears with an enlarged text section. In this 35th edition, this section occupies nearly 1250 pages, an expansion of more than 70 pages. The Catalog Data Section is also expanded to include reference material covering products of 337 manufacturers of equipment.

The enlarged text is due not only to the steady growth in available technical information, but also to the completion of several projects, on which various Technical Advisory Committees of the Society and many individual engineers have been engaged for a number of years.

Following established practice, all known sources of authoritative information were drawn on in the preparation and revision of the text material. Generous contributions of both data and personnel assistance came from Technical Advisory Committees of the Society, from individual Society members, and from other engineers and authorities, including other engineering societies, trade associations and industrial and institutional laboratories. The staff of the Research Laboratory of the Society also prepared parts of the text. The task of co-ordinating and guiding the preparation was accomplished by the Guide Committee, whose members are: Albert Giannini, *chairman;* H. W. Alyea, R. A. Gonzalez, N. B. Hutcheon, A. T. Jones, M. W. Keyes, D. W. Nelson, C. P. Roberts, J. F. Sandfort, B. H. Jennings, *ex officio,* and Carl H. Flink, *technical secretary.*

Two completely revised and rewritten chapters of especially widespread interest are *Chapter 9—Heat Transmission Coefficients of Building Materials and Chapter 44—Control of the Industrial Environment.*

Chapter 9 has long been one of the most widely used chapters in the whole book. In this edition is a wholly new set of *U*-value tables prepared by the ASHAE Technical Advisory Committee on Insulation, with many more constructions included than ever before. Each table contains an illustration with accompanying calculation of one *U*-value and with an explanation of how to convert *U*-values to meet changes in construction and materials.

Chapter 44—Control of the Industrial Environment is a newly added one covering control of environment and exposure of workers. A new method is described for establishing standards for indicating heat stress. A new chart permits combining the effects of various factors into a single *heat stress index.* Methods of controlling heat exposures include: (*a*) control at source; (*b*) exhaust ventilation; (*c*) radiation shielding; and (*d*) local relief. Methods of controlling air contaminant concentrations are given.

Other outstanding improvements include: (1) a rewritten chapter on sound control with new charts and tables covering methods of applying sound control principles with a typical example of their use; (2) a new presentation for the design of hot water heating systems; (3) a step-by-step procedure for designing ceiling and floor heating panels; (4) addition of simplified design data for forced warm air systems; (5) greater detail in description, illustrations, and design of various types of steam heating systems; (6) new tables, charts, and application instructions for pipe and industrial insulation; (7) extended text and diagrams for district heating; (8) extension of refrigerant data and information on lithium bromide equipment; (9) enlarged discussion of corrosion causes and prevention; (10) new information on residential summer air conditioning; and (11) the reference list of existing codes and standards has been carefully and fully revised to bring it up to date. There are 115 new illustrations and many new tables to aid the student and designer.

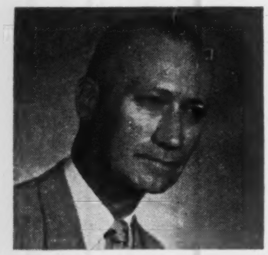
In addition to the changes mentioned, many lesser but important improvements appear in various chapters, as the entire text section has undergone careful study.

The essential features of appearance, format and arrangement are preserved in the new edition with the material grouped into 7 sections: I — Fundamentals, II — Human Reactions, III — Heating and Cooling Loads, IV — Combustion and Consumption of Fuels, V — Systems and Equipment, VI — Special Equipment, and VII — Instruments and Codes. This feature is much appreciated by all who use the successive editions of THE GUIDE.

The entire edition is carefully indexed for ready location of desired information with a 24-page subject index for the technical text section and a 40-page subject index for the Catalog Data Section. Included also as in earlier editions is the 24- x 32-in. ASHAE Psychrometric Chart.

Text of Three Papers from a . . . .

Symposium on Dehumidification



John Everetts, Jr., Moderator

Engineer, Charles S. Leopold, Philadelphia, Pa.

The third session of the 63rd Annual Meeting of ASHAE at Chicago on February 26, 1957 was programmed as a Symposium on Dehumidification. Papers on assigned phases of this general subject were prepared by five leading practitioners. Each read his paper at the session and a discussion period followed. The symposium members were (I) W. E. Ellis, (II) W. L. Ross, (III) E. W. Gifford, (IV) G. W. Higgs, Jr., and (V) E. R. Queer.

Presented here is the full text (without discussions) of the papers (I), (III) and (IV). The full text of the papers (II) and (V) can be found in the ASHAE Journal Section, *Heating, Piping & Air Conditioning*, March 1957, beginning on page 161.

It is expected that the text of all five of these papers will be made available to those interested in a separately printed Bulletin to be issued in the early future.

I—Dehumidification by Mechanical Refrigeration

Mechanical refrigeration can be a very practical means of dehumidifying areas for comfort, processing and storage. Mechanical refrigeration does have limitations, however, which the engineer must know and analyze in order to select dehumidification equipment which will produce desired results. The purpose of this paper is to outline the uses, components, advantages and disadvantages of refrigeration-type dehumidifiers.

Basic Mechanical Refrigeration Systems

Dehumidification by mechanical refrigeration requires the use of a refrigeration system whereby a liquid refrigerant is metered into a coil normally constructed with tubes and fins. The air to be dehumidified is forced through the coil, and, as the air temperature is lowered, the dewpoint of the air is reached and condensation occurs on the prime and extended surface of the coil. The liquid refrigerant that was metered into the coil has taken on the heat from the air passing through the coil and a change of state from liquid to gas results. This is the normal process that occurs in any air-conditioning system using refrigeration, and the usual additional components of a standard refrigeration system are required to remove this gas, circulate it, condense it to a liquid and return it to the evaporator coil as a liquid. To achieve these results a compressor or refrigeration pump is used to remove the gas from the evaporator coil and to circulate the gas in the system; a condenser (either water cooled or air cooled) is used to condense the high temperature gas into a liquid; a receiver is used to store any excess liquid, or the receiver can be eliminated, thereby achieving a critically charged refrigeration system utilizing a capillary tube in lieu of a thermostatic expansion valve. Up to this point, any air-conditioning system using refrigeration can be considered a dehumidifier.

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Desired end results create a design problem in location or relocation of the components, so that dehumidification can be accomplished without imposing additional problems in the space to be dehumidified. In an ordinary air-conditioning system where the identical components are used as just described, the air to be cooled passes through a cooling coil, thereby lowering the temperature and also causing moisture to condense on the evaporator coil. This conditioned air is then discharged into the space to be conditioned, lowering the temperature, but at the same time increasing the relative humidity, especially in the vicinity of supply air discharge grilles (psychrometric chart Fig. 1). This fundamental engineering fact limits the use of standard air-conditioning equipment for effective dehumidification. As an example, a room without any internal load having a desired control point of 80 F and a desired relative humidity of 50 percent would have an exceedingly difficult control problem when the outdoor ambient temperature was 80 F with a high relative humidity of 90 percent, such as an outdoor condition of rain. Since the room would have no internal load and the room or building transmission load would be zero, the air conditioning unit would not operate on the temperature control. However, there would be a constant absolute moisture gain flowing through the walls by vapor transmission. Another moisture gain enters the room by vapor pressure differential through cracks, door openings and infiltration, being driven in not only by wind velocities, but by the actual difference in vapor pressure between the outside conditions and the control conditions within the room. This vapor pressure differential can actually be read in appreciable inches of water pressure differential. Thus, the room to be dehumidified not only would not have the air-conditioning unit running on the temperature control, but would have an increasing relative humidity. If the compressor could be turned on by the humidistat, then the temperature of the coil would decrease and water would condense on the coil. However, the temperature would fall at a more rapid rate than the moisture would be removed by the coil, resulting in an increase of relative humidity.

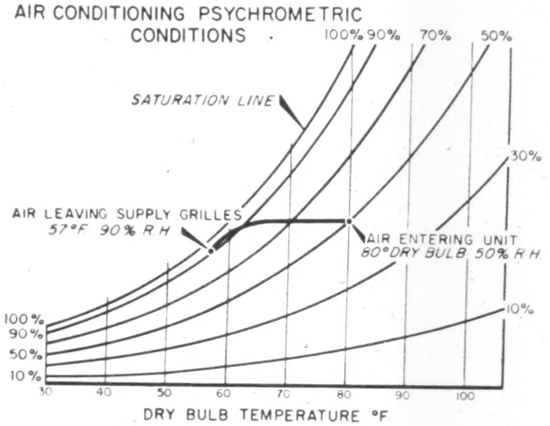

Fig. 1—Dehumidification by mechanical refrigeration for usual air-conditioning applications

Therefore, as the temperature decreases, the relative humidity is increasing. To control a room under such conditions it is necessary to artificially add heat to the room. This is normally done by a process called *reheat* in which heat is added by a steam coil, hot water coil, electric strip heater, gas-fired unit heater or any other method easily available. However, using reheat is costly and requires a complicated control system to achieve the desired results.

If a unit is desired only for dehumidification, then it is advantageous to design a unit that would supply its own heat back to the conditioned space. In the air-conditioning unit as just described, the heat picked up from the air passing through the evaporator coil and the heat given up by horsepower put into the compression of the refrigerant gas is discharged into a medium, either air or water, which is a separate air or water system outside the conditioned space. However, in the dehumidification unit, the heat rejected from the condenser can be efficiently utilized to heat the air leaving the cooling coil, thereby providing a discharge temperature slightly warmer than the air entering the dehumidifier. Thus a dehumidifier designed primarily for a particular dehumidification job does not need any secondary medium for heat removal. This results in a unit that can be located anywhere within the conditioned space, requiring no external connections except a power source. The easiest method of achieving design of this type is to use air-cooled condensing equipment, placing the air-cooled condenser downstream of the cooling coil. The air (see Fig. 2), therefore, would enter the cooling coil and emerge with temperature lowered and moisture removed by condensation, and would then pass through the condenser coil. The result is an outlet temperature higher than inlet temperature to the unit (Fig. 3). This temperature rise occurs because the evaporator coil will remove sensible and latent heat, and the refrigeration system (consequently the condenser) must dissipate the latent and sensible heat removed by the evaporator into sensible heat only. Depending upon the size of the system, it is normally advantageous to design for more air passing through the condenser than through the evaporator to allow the temperature rise across the condenser to be lowered, resulting in a lower head pressure. The lower head pressure in the refrigeration system increases the capacity of the refrigeration compressor, increasing the Btu pumped per watt input. Knowing the design conditions, the engineer, therefore, can either automatically or manually provide an air opening to maintain a minimum temperature rise across the condenser. Utilizing this fundamental design, the revamped air-conditioning unit will now provide a leaving temperature (in the vicinity of supply air grilles) warmer than the entering temperature, having a tendency to lower the relative humidity in addition to removing water.

Design Considerations

Condensate Disposal: In using any mechanical refrigeration equipment for dehumidification by its very nature the moisture extraction is achieved by condensing water on a cold surface. As this condensation occurs, a liquid water buildup results. This water can be retained in a container and operating personnel would then be required to empty it from time to time. Or, the water can be collected in a drain pan and then piped to a drain as shown diagrammatically in Fig. 4. Depending upon the accuracy of control desired, the water surface can present an additional moisture load within the confined area. It should be the design engineer's objective, if the water is to be stored in the unit, that the exposed surface of water should be as small as possible. The design engineer must realize that as the relative humidity decreases, the evaporation at room ambient temperatures increases. Thus the exposed surface of water presents a moisture source. When using units that discharge water through a drain to outside or into a sewer, the design engineer must be very cautious to place a water trap in the line to assure water removal, but yet prevent outdoor humid air from entering the dehumidifier. Air back flow through a drain line can upset the design requirements of the conditioned space.

The drain should be located directly beneath the cooling coil to collect and get rid of the condensed water as soon as possible to prevent re-evaporation by reducing the surface of water exposed to the air. Since the cooling coil has a negative static pressure imposed on it, humid or unconditioned air will be drawn up the drain line if there is no trap present. It is possible to add a considerable moisture load to the confined area by improper drain line design.

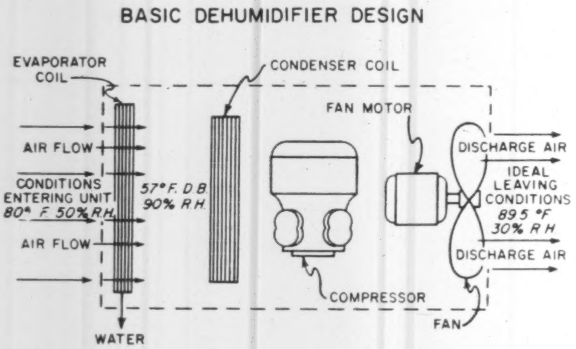

Fig. 2—Basic design arrangement when dehumidifying with mechanical refrigeration

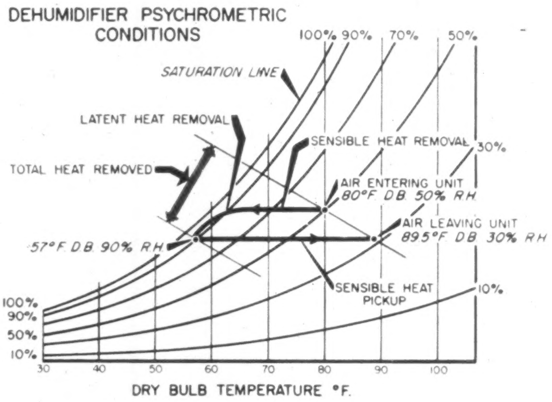

Fig. 3—Psychrometric representation of basic design arrangement illustrated in Fig. 2

Icing: The major problem confronting any engineer designing refrigeration units to be used for dehumidification is a method to prevent the coil from icing. The process dehumidifier is designed for certain fixed entering conditions; by correct component selection, dry-bulb and wet-bulb temperatures can be predicted, and these conditions can be maintained above the freezing point of water. If the conditions entering the unit are constant, the problem of icing normally is nonexistent. However, in storage dehumidification, where the ambient temperature and the relative humidity can vary, the problem of icing of the coils becomes critical. Normal active or inactive storage spaces do not require control of temperature, but they do require an accurate control of relative humidity. Thus, as the ambient temperature changes, the sensible heat removal changes. The refrigeration system will pump a given number of Btu independent of ambient temperature. There are 2 factors affecting this pumping, but they have a tendency to equalize each other. When the ambient temperature goes down — assuming an air-cooled condenser — then the head pressure decreases, rendering the refrigeration cycle more efficient. However, as the ambient temperature goes down, the suction pressure of the refrigeration unit decreases, lowering the capacity of the refrigeration compressor. In the temperature range of 60 to 110 deg, these 2 factors maintain the refrigeration capacity in Btu pumped per unit time about equal. Therefore, lowering ambient temperature reduces the sensible heat that the dehumidifier must remove, and since the compressor is pumping approximately the same amount of heat, the suction pressure falls correspondingly. This results in a lower coil temperature, and eventually the coil becomes frosted, lowering the heat transfer efficiency of the coil, which lowers suction pressure even more, which lowers coil temperature, and the cycle continues until the coil is completely iced. When this happens, no air can pass through the coil and dehumidification ceases. The equipment should not be damaged should this occur, since the design engineer has undoubtedly incorporated a low pressure cutout switch and the compressor will stop. The most serious problem occurring would be the elimination of dehumidification, allowing the room or confined space to go out of control.

If the dehumidifier is run without relative humidity control, the same icing of the cooling coil can occur when the wet-bulb temperature drops to a low value. Some engineers select a dehumidifier of the smaller varieties, one ton or less, and will place the dehumidifier in a room and turn it on. If the wet-bulb temperature decreases, then there is a reduced latent load that the unit must remove. Since the compressor is pumping the same Btu, the sensible temperature depression will be increased. This results in a lower coil temperature, and the same process of icing the coils occurs. In storage areas, experience shows that the design engineer cannot count upon mechanical dehumidification because of icing of the coil, if the ambient air temperature within the storage area is expected to go below 65 F.

The icing problem can be eliminated by the addition of a back pressure regulator valve. This valve maintains the pressure and, consequently, the temperature within the evaporator coil at a predetermined temperature or pressure. Therefore, if this back pressure regulating valve is set for a temperature above 32 F, the coil will not freeze. It is recommended that a full hermetic or a semi-hermetic compressor be used in preference to an open type compressor when a back pressure regulator valve is installed. Due to the modulating effect of a back pressure regulator valve, the pressure in the crankcase of the compressor can and will go below atmospheric pressure, and the open type compressor can cause trouble with seal leaks. Therefore, it is normally advisable to set the low pressure cutout in the 20-in. vacuum range in preference to the +2- or the +5-lb gage measure normal setting. This becomes mandatory since the back pressure regulator can allow a small volume of gas to pass through the regulator which will lower the back pressure in the compressor body. If this low pressure cutout is set slightly above atmospheric pressure, the compressor will cycle on and off rapidly, and the inrush current on the continuous cycling will trip the overload protection of the motor, causing maintenance personnel to be called upon to correct the apparent malfunction.

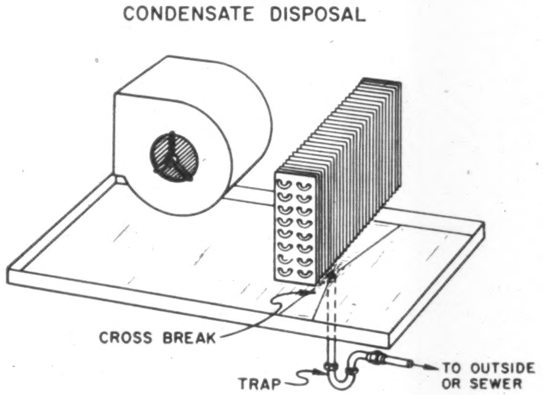

Fig. 4—Suitable condensate disposal should include a trap to prevent entrance of outdoor humid air

Process Dehumidification

The design engineer has the advantage of knowing exact conditions when dehumidification is required for process work, such as in the manufacturing of potato chips, packaging of powdered detergents, sintering of magnets for IF transformers and like process problems. However, many times the process conditions exceed the normal conditions required for space dehumidification. A typical example of this type of dehumidification is the requirement of a photographic laboratory desiring equipment for rapid drying of film and/or prints by mechanical means. There is no particular problem in this type of drying, since heat can be applied, driving off the moisture of the product. However, the dehumidification problem exists, since the confined space will be very humid due to the moisture addition resulting from heating the film and/or print. Therefore, it is advantageous to enclose the dryer in a cabinet and apply heat. Costwise it is advantageous to re-use the heated air providing the moisture can be removed from the air. The print and film properties are such that quality control problems exist if the drying temperature exceeds 130 F. Therefore, the problem is to cause 130 F air with a relative humidity not exceeding 40 percent to enter a dehumidifier and there to lower the moisture content of the air while keeping the dehumidifier discharge temperature at approximately 130 F. To do this the only heat that would be required in the dryer would be that heat required to vaporize the water within the product, plus the heat that is lost in transmission through the cabinet. However, the dehumidifier design becomes one of critical nature. To remove 6 pints of water per hour, it was the author's experience that the air quantity could be varied between 40 and 110 cfm passing through the dehumidifier without changing the water removal capacity of the dehumidifier. The coil face area was 32 sq in., and exceptional results were obtained using all prime surface for the evaporator coil with prime copper integral fin tubing, 1-in. O.D. × ⅜-in. I.D. The depth of the coil was 8 in. With 130 F entering, the leaving temperatures were 70 F with a 42 F refrigerant temperature. The air then passed through the circulating fan and into a reheat coil. With Refrigerant-12 and using the same type integral fin tubing, the reheat coil was 25 sq in. face area and 5 in. thick. As long as the head pressure of 232 lb was maintained, a leaving air temperature from the dehumidifier was maintained at 130 F. A main condenser was used having 144 sq in. face area, 3 in. deep to provide additional sensible heat removal to maintain the head pressures within reasonable limits. However, these conditions presented an actual problem of additional compressor motor horsepower per cubic foot of refrigerant gas pumped. It has been the writer's experience that the best commercially available compressor has 0.26 hp per cu ft of gas displacement. However, this particular job required approximately 0.30 hp per cu ft of gas displacement. It is standard procedure to use 0.35 hp per cu ft of gas displacement as the head pressures increase above 200-lb pressure gage.

Process dehumidification fills an industrial need not generally known. The engineer must educate the industrialist to recognize the importance of controlled dehumidification.

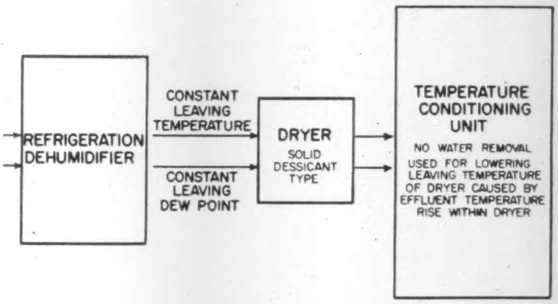
REFRIGERATION DEHUMIDIFIER
CONSTANT LEAVING TEMPERATURE
CONSTANT LEAVING DEW POINT
DRYER
SOLID DESSICANT TYPE
TEMPERATURE CONDITIONING UNIT
NO WATER REMOVAL
USED FOR LOWERING LEAVING TEMPERATURE OF DRYER CAUSED BY EFFLUENT TEMPERATURE RISE WITHIN DRYER

Fig. 5—Diagrammatic arrangement of equipment when mechanical refrigeration is combined with adsorbents for dehumidification

Combining Refrigeration with Adsorption

Mechanical refrigeration dehumidification equipment can greatly lessen the load for adsorption units when high temperature, high dew-point air is entering the system, and low dew-point leaving air is required. In this phase of mechanical dehumidification, the refrigeration equipment is placed before the adsorption units (see Fig. 5). Refrigeration equipment can be located downstream from the adsorption unit, but in this case it is cooling equipment only and decreases the effluent temperature rise created in the adsorption unit. The refrigeration unit preceding the adsorption unit is used as a constant temperature system similar to the average air-conditioning unit, whereby the air is cooled and the moisture condenses out upon the cooling surface. The heat rejection from the air-conditioning unit is completely separate. It is advantageous, when the inlet conditions may vary, to maintain a constant coil temperature. This is done by utilizing the back pressure regulator type control system, thereby maintaining a constant leaving temperature and dew-point. The sizing of the adsorption system can therefore be predicated on a low sensible temperature entering the dryer at a high relative humidity. Operating costs can be reduced by a combination unit. For example, a quantity of 300 cfm of air entering with 212 grains of moisture per lb of dry air with the required effluent dew-point of −40 F could advantageously use a 5-ton precooling unit removing about 32 lb of moisture per hr, and an adsorbent dehumidifier to remove the balance of 7 lb of moisture per hr.

The power economy, expressed in kilowatt hours per pound of moisture removed, for such a system would be around 0.6 for the refrigeration part of the system and 1.3 for the adsorption system, with an overall economy of 0.7 kwhr per lb of H_2O; an entire refrigeration system would require about 1 kwhr per lb H_2O, and an all desiccant system for the conditions cited, about 0.9 kwhr per lb of H_2O. The moisture retaining properties of the adsorbent increase sharply as the relative humidity of the inlet air increases. Consequently, the adsorption unit can work more efficiently under these circumstances. The adsorption type unit is more efficient as the inlet temperature decreases. Thus, reheat is definitely a disadvantage when using a combination refrigeration and adsorption system. It is the designing engineer's problem to prevent liquid water carryover into the adsorption unit. In the case of solid adsorbents, liquid water causes physical breakdown of the desiccant.

Summary

To summarize the main points:

1. A basic mechanical refrigeration system of air conditioning can be considered a dehumidifier, but under normal conditions lowering the temperature increases relative humidity. This fundamental engineering fact limits the use of standard equipment for effective dehumidification. For best results a unit should be designed specifically for dehumidification.

2. In any mechanical refrigeration system dehumidification is achieved by condensing water on a cold surface. Drains for condensate disposal and exposed water surfaces should be carefully designed as it is possible to add a considerable moisture load to the confined area by improper design.

3. The major problem confronting any engineer designing refrigeration units to be used for dehumidification is a method to prevent the coil from icing. This is especially critical in storage dehumidification where the ambient temperature and the relative humidity can vary.

4. Process dehumidification fills an industrial need not generally known. The engineer must educate the industrialist to recognize the importance of controlled dehumidification.

5. Mechanical refrigeration equipment used in conjunction with adsorption units greatly lessens the load on these units when high temperature, high dew-point air is entering the system, and low dew-point leaving air is required.

It is the writer's opinion that mechanical refrigeration can be applied to dehumidification problems:

1. *Advantageously* when entering temperatures are above 80 F and entering relative humidities are above 50 percent.

2. *Under certain conditions* when entering temperatures are between 65 and 80 F and entering relative humidities are between 40 and 50 percent.

3. *Very rarely* when entering temperatures are below 65 F and dew-point temperatures are below 40 F.

In designing equipment especially for dehumidification, the importance of control cannot be overemphasized. As the required percent of relative humidity decreases and the control point becomes more critical, the better engineered the dehumidification unit must be.

Mechanical refrigeration can be a very practical method of dehumidification, but it does have limitations which the engineer must know and analyze to be sure the dehumidification equipment he designs will produce the desired results.

III—Dehumidification by Liquid Sorbents

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Within the framework of this symposium, liquid sorbents are hygroscopic liquids which have the ability to absorb moisture from a mixture of air and water vapor in contact with them. They are in essence solutions having low vapor pressures at the temperatures encountered today in commercial and industrial air conditioning work. In general they should have the following characteristics: (1) suitable vapor pressure characteristics and should not crystallize at temperatures 10 to 15 deg below the temperature range used in the operating cycle; (2) be non-corrosive; (3) be odorless; (4) have stability, and not break down over the range of use, and not vaporize; (5) have low viscosity and good heat transfer characteristics; (6) be non-toxic and non-inflammable; (7) be capable of being regenerated at temperatures obtainable with 1 lb steam; and (8) be widely available and economical to manufacture.

There are many solutions which fall, either in whole or in part, within the aforementioned definition. These include aqueous solutions of lithium chloride, lithium bromide, calcium chloride, calcium bromide, mixtures of the chloride and bromide salts, and the ethylene glycols. All of these have been used in liquid sorbent systems. There are only 2 solutions in common use today. These are an aqueous solution of lithium chloride and an aqueous solution of triethylene glycol.

For both of these solutions equipments in a wide range of sizes from 1000 cfm of air-treated capacity to 20,000 cfm are currently in production. In the handling of many problems liquid sorption or dehumidifying equipment is used in multiple, being installed in either series or parallel as the occasion demands.

How does a liquid sorbents system work? (See Fig. 1). Air to be dehumidified or desiccated is drawn into a contactor or dehumidifying cell, where it comes in contact with a spray of the aqueous solution of the sorbent liquid. This contactor cell normally will contain a cooling coil through which city water, well water, cooling tower water, brine or a refrigerant will be circulated to absorb the latent heat involved and to maintain the sorbent solution at a constant temperature as determined by the job requirements. From the contactor cell, the air will normally pass through a set of eliminators and on out to the conditioning system for further heating or cooling as required by the problem under consideration. The sorbent solution having picked up a certain amount of moisture or water vapor in the contactor coil must be regenerated or desorbed and brought back to its original condition. This is brought about by spraying the sorbent onto a second coil, normally called a regenerator, through which a scavenging air stream is passed and which is equipped with heating coils, using either hot water or steam, to heat the sorbent solution and scavenging air in order to boil off on the regenerator side that moisture which was picked up on the contactor side. Reactivation is generally accomplished with a reactivation media having a temperature between 200 F and 270 F; generally speaking this covers the range of hot water at 200 or higher and steam at up to 25 psig. Reactivation may be accomplished either as described or by heating the scavenging air stream or by heating the sorbent solution in a shell-and-tube heat exchanger and spraying hot sorbent into scavenging air stream.

While the manufacturers of the presently available equipment publish rating tables applying to their products and the hygroscopic solutions used in them, it is believed that the picture of the equipment design possibilities and application possibilities can best be presented in Fig. 2. There is plotted on an outline psychrometric chart the equilibrium curves of water (A); of ethylene glycol solution at 80 percent (B), 90 percent (C), and 95 percent (D); of lithium chloride at 36 percent (E), at 40 percent (F), and at 44 percent (G). The glycol solution curves are percent by volume. The lithium chloride curves are percent by weight of dry salt.

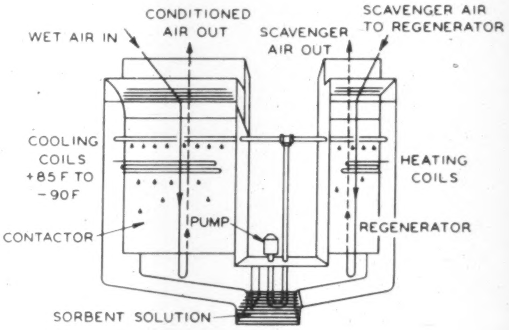


Fig. 1—Diagrammatic arrangement of an equipment using a liquid sorbent solution

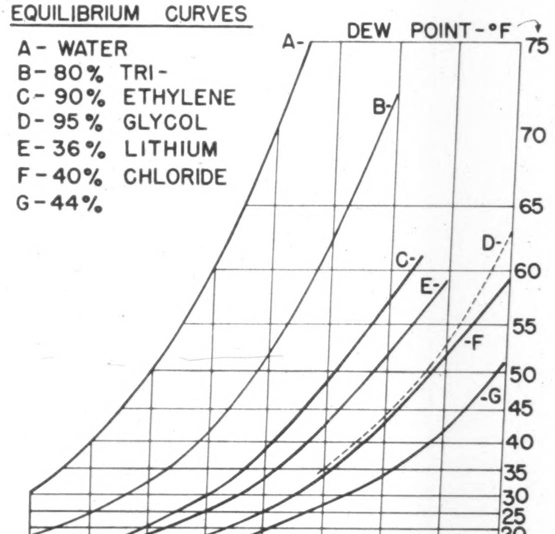


Fig. 2—Psychrometric chart of various liquid sorbent solutions

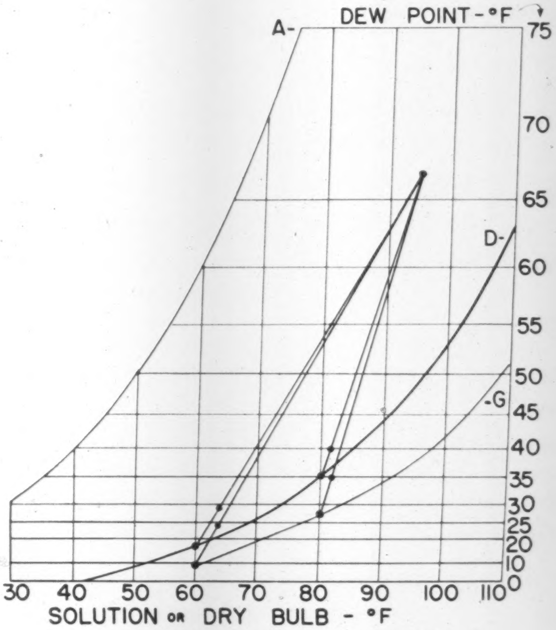


Fig. 3—Psychrometric diagram of solution of a typical drying problem with a glycol solution or a lithium chloride solution

Journal Section

Consider for a moment curves D and C as reproduced on Fig. 3. Assuming that a cooling medium such as water is available at suitable temperature and in sufficient quantity to maintain a sorbent solution temperature of 80 F, and assuming that the equipment presents sufficient sorbent solution surface to permit a 90 percent approach, then it is found that with the glycol solution one can take a quantity of air at 95 F, 75 F wet-bulb, 99 grains per lb, and reduce it to 81 F dry-bulb, 40 F dew-point, 58 F wet-bulb, 36 grains per lb; and with lithium chloride solution reduce it to 81 F dry-bulb, 35 F dew-point, 56½ F wet-bulb, 30 grains per lb with an enclosure to be maintained at 80 F and 45 percent relative humidity (RH), which is approximately 70 grains per lb of dry air. It will require 18 percent more air to handle the internal moisture load with the glycol medium than with the lithium chloride, although both liquid sorbents can produce the same end result in the space.

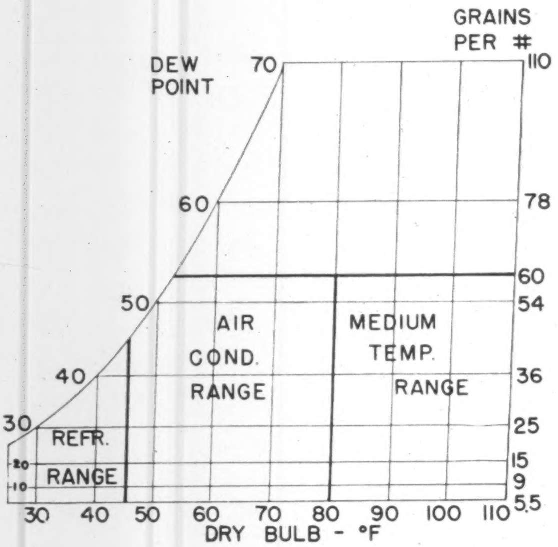


Fig. 4—Chart showing the range of conditions over which the liquid sorbents find many present applications

In this example, if the room absolute moisture content were required to be below 36 grains per lb it would be impossible to handle the pickup of any internal moisture load with the equipment using this specific glycol solution.

Assuming a 60 F maintained sorbent solution temperature with air again entering at 95/75, 99 grains per lb, it will be seen that the leaving condition is 64 F dry-bulb, 24 F dew-point, 46¼ F wet-bulb, 19 grains per lb for the 44 percent lithium chloride solution. With the 95 percent glycol solution, leaving conditions would be 64 F dry-bulb, 27½ F dew-point, 47¼ F wet-bulb and 23 grains per lb.

Going back to the 80 F, 45 percent RH room condition, 70 grains per lb the glycol system would only have to handle 8 percent more air than the lithium chloride to produce the same result. In the case of the lithium chloride system use of the 60 F solution temperature would require dehumidification of 79 percent of the air that would be required to be dehumidified with the 80 F solution temperature.

While the 2 foregoing examples obviously involve the use of all outside air, it must be borne in mind that many times it is desirable for the application engineer or consultants to blend a mixture of outside and room air and desiccate, desorb, dehumidify or treat the mixture in the liquid sorbent equipment.

What are the advantages of liquid sorbents? *First*, sterile air. Air, bacteria, and mold free. Research at the University of Toledo on lithium chloride solutions obtained 97 percent removal of airborne micro-organisms from the air treated. *Second*, divorcement of the latent heat removal from the sensible heat removal of the air to be used within a conditioned enclosure with the resulting ability to control both the sensible heat removal and the latent heat removal independently. *Third*, a constant quality of air delivered from the liquid sorbent equipment. This quality is never cyclic with the use of modulating controls. *Fourth*, reactivation of the liquid sorbent with medias such as low pressure steam and hot water, having temperatures as low as 200 F.

Liquid sorbents, when compared with the solid sorbents, show themselves to better advantage in installations requiring 1000 cfm of desiccated air or more and also to those installations having entering conditions to the dehumidifying equipment of 60 grains per lb to 80 grains per lb or more. Conversely, the solid sorbents show themselves to advantage with the lower entering moisture conditions and the smaller air quantities or more properly the small moisture sorbing requirement; roughly in the range of 15 lb of moisture per hr to be removed, or lower.

Speaking as one who works from time to time with both the liquid and solid sorbents, and also with refrigeration as the dehumidifying medium, any remarks made here have to be tempered with an analysis of the Btu requirements of the proposed installation, the utilities available and their cost, as well as available space and means for making the installation. In brief, those factors which make the engineer and consultant so necessary.

Corrosion today is no problem with the liquid sorbents. Advances in metallurgy, increased knowledge of the corrosion mechanisms, as well as the use of inhibitors in the sorbent solutions have gotten the process away from the problems which beset it in the days when it was in its swaddling clothes. There is no more trouble from corrosion today with the liquid sorbents than there is in keeping a shaft-seal tight on a refrigeration machine operating at 1750 rpm. Many engineers have wrestled with that problem not so many years back.

In one sense, the fact that for many types of installations the use of liquid sorbents may increase the first cost of an installation is a deterrent to their more widespread use and consequently could be called a disadvantage, even though the performance, efficiency, and value of the installation is increased.

Through their use as a means of improving the quality of the results obtained from an air-conditioning system the liquid sorbents offer a definite challenge to those engineers in the field who are striving today to do a better job than yesterday.

In what types of existing applications do the liquid sorbents apply? (See Fig. 4). *First,* in the medium temperature range, where dry-bulb temperatures between 80 F and 120 F are used and the delivered air moisture content should be 60 grains per lb of dry air or lower. Such applications include those as in gelatin and glue driers, cake icing driers, or trolley rooms of bakeries, in drying basic vitamins, pharmaceuticals, the application of candy coatings on gums and in the handling of a number of other products during manufacture when these products are spoiled or have a shortened shelf life if temperature during production rises above a certain critical. Applications for cupola dry blast might also be considered in this same range.

In the air-conditioning range where the delivered air might be in the range of from 45 F to 80 F dry-bulb, and with moisture content of the delivered air generally below 60 grains per lb. This is the basic comfort air conditioning and process air-conditioning range. In these installations the liquid sorbents are generally used in combination with either well water or refrigeration to handle the sensible heat load requirements of the installations.

In the refrigeration range, where leaving dry-bulb of 0 F to 45 F with moisture content below 45 grains per lb is required of the equipment, liquid sorbents in combination with cold brines, direct expansion or flooded refrigeration are used. Typical applications include beer cellars, beer fermentation rooms, meat storage, penicillin processing, sugar cooling and conveying, and the manufacture of chewing gum.

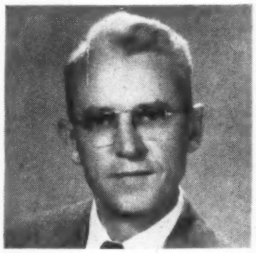
In the low temperature range, where leaving dry-bulb of below 0 F are required and moisture content of the leaving air will be at or near the dew-point of the leaving air, applications such as wind tunnels, laboratories, plant growing rooms, tunnel cooling of candy bars are frequent.

Often in the range of from −90 F up to +30 F the primary value of the liquid sorbents as dehumidifying media is forgotten and use is made of sorbent solutions to provide uniced, frost-free coils and maximum heat transfer of the cooling surfaces used to produce the desired temperatures.

In conclusion, the flexibility of the available equipments, the ability to vary performance of these equipments using the liquid sorbents over a wide range through control of solution temperature and solution density or solution quality, and also the air quantity treated together with the ability to create sterile atmospheres, have lead to the fairly wide use of the liquid sorbents by industry.

The sterile atmosphere feature alone should lead to an increasing use of the liquid sorbents in comfort air conditioning in the future. The liquid sorbents and the available equipments in which they are used are an added tool in the hands of consulting engineers and designers. Their proper application and use is a challenge to them, but the time and effort spent in learning about them and their application is going to be rewarded by the production of better system designs, better operating results, and better satisfied clients.

IV—Economics of Dehumidified Storage



G. W. HIGGS, JR., assistant manager, Supply, Marine Corps, and Research Facilities Br., Construction Div., Bureau of Yards and Docks, Navy Dept., Washington, D.C. Attended Antioch College; B.S. in C.E. from N.Y.U.; post-graduate study at The George Washington U. 23 years of government service. Numerous military inter-departmental committees including chairmanship Committee to Evaluate Dehumidified Storage.

Generally the adoption of an engineering application is dependent on at least 1 of 2 factors; one, the desired objective can be reached in no other way or; two, the desired objective can be attained more economically through the use of the engineering application. Therefore, in addition to knowing the techniques of dehumidification, it is of interest to investigate its value to users or potential users. This paper is devoted to an exploration of the economics of dehumidification as applied to storage, particularly the storage problems of the military establishment.

The first large scale application in the Navy was in the Reserve Fleet, where dehumidification was utilized to protect ship interiors, their contents and some of the topside equipment from the deteriorating effects of rust, corrosion, mildew, fungi and other moisture-supported life. This application has been very successful, and dehumidification of storage space ashore has been an outgrowth of this work.

Why dehumidification? To refer to an eminent authority, Dr. Glenn A. Greathouse, when keynoting a recent Symposium on Preservation for Mobilization,[1] stated that climate conditions are the most important factors in deterioration and, of these factors, moisture is the most important. Rust and corrosion account for the major portion of losses from deterioration; microbiological attacks are in second place. Moisture by itself is not a serious causative agent, but is essential to the electro-chemical deterioration of metals and to the life processes of microbiological and other forms of destructive organisms. Oxygen, ozone, sunlight, atmospheric contaminants, temperature and moisture are all contributing factors but, if liquid moisture is eliminated and the humidity suitably controlled the total deteriorative effect of these factors is within acceptable limits for most materials.

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[1] Exponent numerals refer to References.

Journal Section

Tests conducted by the Bureau of Ships[2] indicate that an atmosphere of 30 percent relative humidity (RH) is advisable in an enclosure such as topside compartments of ships where relatively rapid temperature changes are experienced. From the same tests the Bureau of Supplies and Accounts concluded that 40 percent RH would be adequately safe in large warehouses under relatively stable temperature conditions. These relative humidity maximums are selected to control deteriorations of metals. Dr. Greathouse and others[1] have indicated that 60 percent RH is low enough to control microbiological attack. Storage under the 30 percent to 40 percent RH range has no undesirable effects on metals, nor on rubber type compounds.[3] Some organic materials — sisal, hemp, paper — may lose flexibility and strength but regain these characteristics with regain of moisture content.[4]

Protecting the stored items from liquid moisture requires a shelter with rain-proof walls and roof, and a floor free from flooding by surface water; a conventional warehouse should do this. Providing the 40 percent RH atmosphere requires floors, walls, roof, and openings which are reasonably resistive to the passage of moisture vapor by infiltration as part of the air-moisture vapor mixture, transmission by absorption and reevaporation, or diffusion due to moisture vapor permeability.

What does it cost? Navy experience in converting some 8,500,000 sq ft of warehouses to dehumidified storage and constructing some 700,000 sq ft expressly for dehumidified storage indicates that the additional measures against moisture entry plus the dehumidification equipment and controls averages about 40 cents per sq ft of warehouse space, present day, stateside costs. Maintenance and operation of the dehumidification features cost from 2 to 5 cents per sq ft per year depending on climate and power costs. Our best analyses indicate that half to two-thirds of the operational load is due to infiltration — just plain wind infiltration. We estimate approximately 360,000 lb of moisture vapor per year is removed from a warehouse of 120,000 sq ft in eastern Pennsylvania, at a cost of $4,800 or about 1 kw per lb of water. Costs and other data are given in Navy Movie MN-8077 on *Dehumidified Storage*.[5] Recent Air Force estimates of cost for converting and operating numerous warehouses are very close to these figures.

How do we provide dehumidification? All the Navy installations stateside use solid sorbent electrically operated dehumidifiers. We have conducted experiments on selective ventilation in conjunction with comfort heating which show the practicability of selective ventilation when adequate periods of low dew-point ambient air are available.[6] The Navy has not made an installation dependent on selective ventilation, but the Air Force is considering it for a Depot in Utah.[7] One Navy installation in the south Pacific utilizes refrigerant type for both cooling and dehumidification of space for storage of cereal foods.

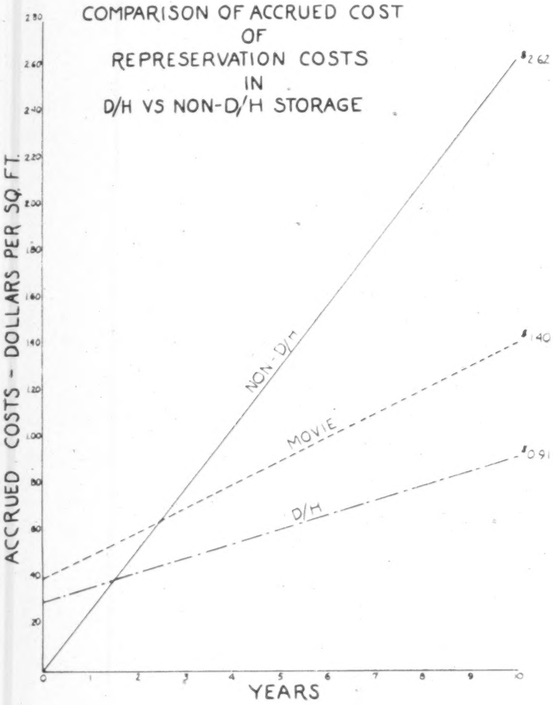

Fig. 1 — Cost comparison curves

A major task in military storage is to economically provide optimum conditions for the prevention of deterioration of ferrous and non-ferrous metals and the materials of organic origin associated with these metals in complex equipment. How well does dehumidified storage assist in this task?

The Chief of the Bureau of Supplies and Accounts, giving opinions derived from several years observation and experience at the large inland depots, furnished the following:

1. Method II packaging (desiccated vapor-barrier packages) had proven effective up to 4 years in covered storage and indefinitely in dehumidified warehouses. Inspection of desiccant in such packages initially stored in dehumidified warehouses showed no sign of saturation after 3 years storage whereas the desiccant in similar packages stored in non-dehumidified warehouses was completely spent and required replacement.
2. Steam propulsion equipment normally treated with contact preservatives will not require represervation for up to 9 years when stored in dehumidified warehouses compared to 4 years in non-dehumidified warehouses.
3. Inspections to determine condition of material need be conducted only about half as frequently in dehumidified storage as in non-dehumidified storage, as in certain items excepted.
4. Preservation expenditures are reduced approximately 50 per cent when dehumidified storage is utilized.

One inland supply depot furnishes data from which Fig. 1 was prepared. Preservation costs are charted against initial plus maintenance and operation costs of dehumidification features. Accumulated costs in dollars per gross square foot of dehumid-

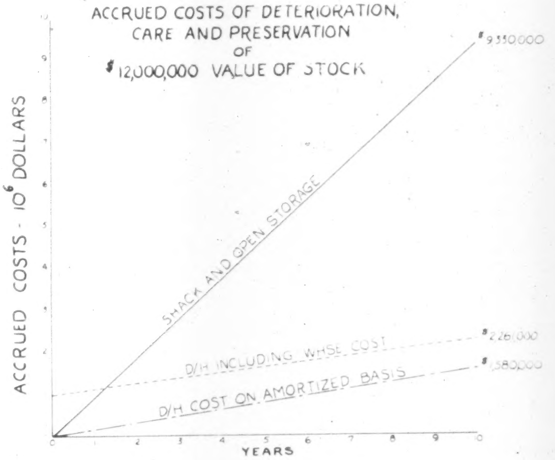

Fig. 2 — Comparison of accrued costs of keeping a $12,000,000 stock

ified space are plotted on the vertical ordinate, years are plotted horizontally. The solid line represents accrued costs of cyclic preservation experienced in non-dehumidified warehouses. The dash-dot line represents the comparable experience in dehumidified warehouses, charging in the initial cost of conversion and dehumidification on the first day of use. Note that the line for dehumidified storage passes below the line for non-dehumidified storage at about 1½ years time, indicating a recovery of the initial investment for dehumidification installation and savings from that time on. These data are based on several years experience involving 2,500,000 sq ft of covered storage of which 11 percent is dehumidified, and applies to a wide range of Naval materials. The costs for dehumidification at this depot are lower than usual due to favorable power rates and climate. To more nearly represent the normal situation the middle or dotted line of Fig. 1 represents the data from the Navy movie mentioned earlier. Thus on the basis of dehumidification costs experienced in the eastern United States, a recovery of initial investment might be expected in about 2½ years, after which net savings should be experienced. These data apply to items normally given covered storage at a large supply depot.

Fig. 2 presents data given in support of a request to Congress for funds and authority to construct a dehumidified warehouse of approximately 120,000 sq ft. The warehouse was desired to provide economical storage for packaged parts, assemblies, and materials currently being stored outdoors under tarpaulins or in makeshift World War II shacks. The chart presents the estimated costs for deterioration, care, and preservation of $12,000,000 worth of stock including the maintenance of the shelter provided. Accrued costs in millions of dollars are plotted on the vertical ordinate and years are plotted horizontally. The solid line represents the estimated costs in shack and open storage. The dotted line represents the estimated cost of dehumidified storage including the total cost of the dehumidified warehouse and adjacent roads, tracks and utilities. Note that the dehumidified warehouse cost passes below the shack and open storage accrued cost at about 1¼ years, indicating rapid recovery of the initial investment for a new dehumidified warehouse. The dash-dot line represents the costs for the dehumidified storage based on 20-year amortization of the initial cost of the warehouse. Good stories have a happy ending; Congress granted the funds and authority, and a contract has been awarded for construction.

Army Ordnance depends heavily on dehumidified storage to provide economical preservation of machine tools pending their need in factories to produce military items. Some contact preservation is used, of viscosities that will not interfere with rapid reactivation of production lines. Army Ordnance uses dehumidified shelters inside the factory, or dehumidified warehouses on or near factory sites, as well as dehumidified space in depot warehouses and underground limestone mines. The Army also utilizes dehumidified storage for military end products.

The Air Force has conducted a survey of 4 of their depots. The Chairman of this Air Force study, speaking in Washington last fall estimated that a dollar invested in dehumidification of depot storage space could return 10 dollars a year in gross savings, if initial conversion and equipment costs are amortized over a 20-year period.

Although these excellent experiences and prospects apply to many millions of square feet of military storage space, each application of dehumidified storage space merits serious study. The military storage system comprises some three million different items which might be most economically stored in a 30 to 40 percent relative humidity atmosphere. These items range from rather cheap bits of material to very expensive and complex assemblies. Some are readily available, others have long lead time. Some part of the stock of most items may be consumed overseas, involving severe exposures in shipment and destination, hence, requiring special protective packaging or protective coatings. The portion of the stock of the same items which is consumed stateside may be adequately protected to the point and time of consumption by ordinary domestic packaging and dehumidified storage.

To examine one borderline problem case, let us consider construction and automotive equipment used by the Seabees. The available data is based chiefly upon estimates of initial preservation, cyclic inspection and represervation. Recently installed cost keeping systems and tests of the effects of different storage conditions are expected to provide data for more accurate analyses.

Fig. 3 compares estimated accrued costs for preserving an average piece of complex, uncrated equipment of an average value of $8,500 which will occupy about 160 sq ft of storage space thus requiring about 240 sq ft of gross building space to allow for aisles, etc. Construction costs are estimated at $4.00 budget price for ordinary warehouses and $4.50 per gross sq ft for dehumidified warehouses. This average piece of equipment is to be kept in readiness for overseas shipment, hence, initially and during the storage period it must be treated with contact preservatives to protect it during severe shipment and destination conditions. It is hoped that the stock of the item can be rotated every 2 years to keep this reserve item up to date. On Fig. 3 the accrued cost in dollars is plotted vertically, and years are plotted horizontally and 5 rotations of stock are charted. The solid, steeply rising line represents accrued costs for open storage; the dotted line, the accrued costs for dehumidified storage; and the dash line, the accrued costs for covered storage. Evidently open storage is not economical. It's about a tossup between ordinary storage and dehumidified storage, judging from present data. It would seem prudent to initially construct dehumidified warehouses, or to so construct that the dehumidification may be readily added later if so indicated by data now being observed. This average piece of equipment develops only about $36 per gross sq ft of warehouse space, a very low value for warehouse usage. It is relatively available, and quite resistive to short term outdoor exposure. Consequently, accurate cost and deterioration data are required to make the wisest choice of preservation methods.

Summary

Now to summarize. Climatic factors influence the rate of deterioration of materials. Moisture, acting in combination with the other factors, is the most influential causative agent. Controlling the moisture substantially controls the rate of deterioration of most materials. Therefore, deterioration can be controlled by eliminating liquid moisture and reducing vapor moisture to the range of 30 to 40 percent relative humidity. Consequently, pieces of controlled climate are created by dehumidification of covered storage space.

The costs for dehumidification are low, averaging about 40 cents per gross sq ft initially, and 2 to 5 cents per gross sq ft annually. These costs are very cheap for valuable military stores which are susceptible to moisture caused deterioration, and which may remain in storage for several years. The logistic systems of the military are complex and involve millions of different items subject to varying conditions of supply, shipment, destination, period and condition of storage, and of place of use. Consequently, each application of dehumidified storage deserves careful study.

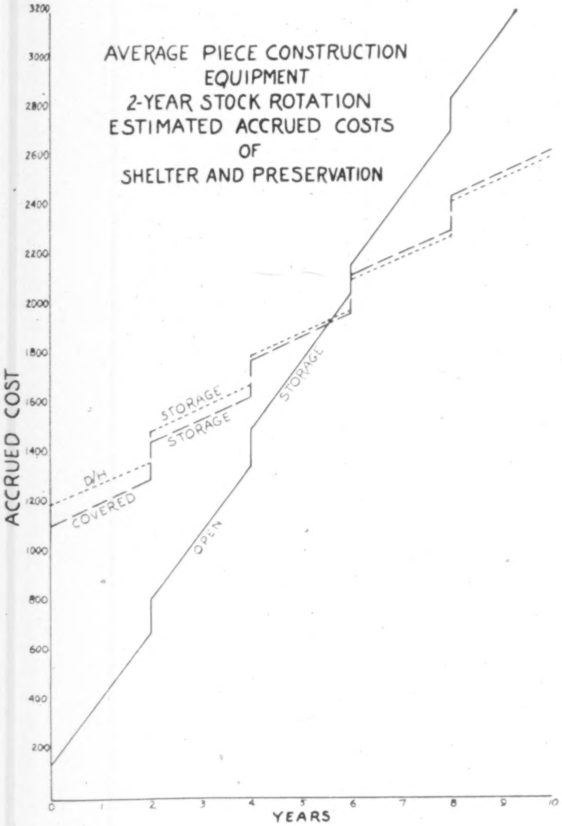

Fig. 3 — Cost comparison of open storage, covered storage, and D/H storage

References

1. Symposium on Preservation for Mobilization Requirements — Keynote address by Dr. Glenn A. Greathouse (Naval Civil Engineering Research and Evaluation Laboratory, October 1956).

2. Report on Laboratory Tests to Determine Any Adverse Effect of High or Low Humidity on Materials and Equipment Found Aboard U. S. Naval Vessels (Industrial Test Laboratory, U. S. Naval Base, Philadelphia — Report 3014-P).

3. First Joint Military-Industry Packaging and Materials Handling Symposium — Paper by W. F. Durbin (*Proceedings*, Goodyear Tire & Rubber Co., Panel A6, October 1955).

4. Symposium on Preservation for Mobilization Requirements — Research Fleet D/H Containers and Shelters — Paper by Milton Levy (Naval Civil Engineering Research and Evaluation Laboratory, Port Hueneme, Calif., October 1956).

5. Second Joint Military-Industry Packaging and Materials Handling Symposium — Paper by Claude R. Miller, USAF (*Proceedings*, Panel Dehumidified Storage, October 1956).

6. Dehumidification by Heating and Ventilation — Summary Report, by E. R. Queer, E. R. McLaughlin and F. A. Joy (Contract NOy 70760, Bureau of Yards and Docks, 1953).

7. Controlled Humidity Storage in AMC Warehouses as Proposed for Hill Air Force Base, prepared by Management Engineering Branch (Manpower and Organization Division, Directorate of Personnel and Support Operations, Headquarters Air Material Command, Wright-Patterson Air Force Base, Ohio, October 1956).

View of St. Lawrence from Steamer

Make Reservations Promptly for Semi-Annual Meeting of Society

The Semi-Annual Meeting of the Society at Murray Bay on the St. Lawrence River in the Manoir Richelieu, June 24-26, 1957, is attracting the interest of many members.

They are thinking about how enjoyable it must be on the overnight boat trip from either Montreal or Quebec to Murray Bay, and quite a few expect to include the trip up the Saguenay either on their way to or back from the Semi-Annual Meeting.

Special reservation forms were sent to all members last month. It is advisable that these be returned to the Canada Steamship Lines, Montreal, prior to May 1 to insure boat and hotel reservations. Confirmation of hotel reservations, steamer tickets, baggage tags and other credentials will be sent to the member directly by the Canada Steamship Lines. The member, in turn, will remit a draft in Canadian funds payable to the Canada Steamship Lines.

The Semi-Annual Meeting will open Monday afternoon, June 24, with a second session being conducted simultaneously. Likewise there will be 2 sessions on both Tuesday and Wednesday mornings, with the Meeting officially closing at the conclusion of the final session on Wednesday morning.

Members traveling by steamer and departing from either Montreal or Quebec must make the Sunday, June 23, sailing to arrive in time for the opening of the Semi-Annual Meeting. An earlier departure on Saturday, with arrival at Murray Bay on Sunday, June 23, provides more leisure time to get established and plan for the coming activities.

It also is possible to enjoy the trip up the Saguenay on the way to the meeting by departing from Montreal or Quebec on Friday, June 21, arriving at Murray Bay, Sunday, June 23. If the trip is planned for after the meeting, the departure from Murray Bay will be Thursday, June 27, with arrival back in Montreal or Quebec on Saturday, June 29.

The Montreal Chapter Committee on Arrangements, D. Lorne Lindsay, general chairman, will offer some special events of their own as well as the abundance of available recreational facilities provided by the Manoir Richelieu. The Annual ASHAE Golf Tournament will be held Tuesday afternoon, June 25, and the Semi-Annual Banquet will take place that evening.

The Manoir Richelieu offers dancing in the Casino on Saturday evenings and both movies and a concert on Sunday evenings. In addition there are facilities for swimming, tennis, golf, horseback riding and other outdoor sports.

The steamer is, of course, not the only mode of travel to Murray Bay. It is possible to drive directly to the

Manoir Richelieu, and rail transportation also is available from either Montreal or Quebec. Select the method of travel most convenient for you, but most important of all make reservations now. There is much to see and do at Murray Bay in addition to attending the Semi-Annual Meeting, but none of it will be completely enjoyable if *you* are not there!

Advance Technical Program

Semi-Annual Meeting, Murray Bay, Que., Canada
Manoir Richelieu June 24-26, 1957

Saturday — June 22

2:30 p.m. Committee Meetings

Sunday — June 23

1:30 p.m. REGISTRATION
2:00 p.m. Council Meeting
2:00 p.m. Committee Meetings

Monday — June 24

9:00 a.m. REGISTRATION
9:00 a.m. Committee Meetings
2:00 p.m. FIRST SESSION
Call to Order — Pres. P. B. Gordon
Greetings by D. Lorne Lindsay, Chairman, Committee on Arrangements
2:00 p.m. SECOND SESSION
Call to Order — 1st Vice Pres. E. R. Queer
SYMPOSIUM ON AIR-CONDITIONING INSTRUMENTATION
C. H. Pesterfield, Symposium Chairman
R. N. Pond, Moderator
The Fundamentals of Commercial Controls — V. Robert Baird
Control of High Velocity Single Duct Systems — W. G. Young
Control of High Velocity Double Duct Systems — H. W. Alyea
Coordination of High Velocity System Design — L. F. Flagg
9:00 p.m. Habitat Evening

Tuesday — June 25

9:00 a.m. REGISTRATION
9:30 a.m. THIRD SESSION
Call to Order — 2nd Vice Pres. A. J. Hess
9:30 a.m. FOURTH SESSION
Call to Order — Treas. C. H. Pesterfield
1:30 p.m. Golf Tournament
7:00 p.m. BANQUET

Wednesday — June 26

9:00 a.m. REGISTRATION
9:30 a.m. FIFTH SESSION
Call to Order — 1st Vice Pres. E. R. Queer
SYMPOSIUM ON SOUND AND VIBRATION
John Everetts, Jr., Symposium Chairman
J. B. Graham, Moderator
Sound Standards for Testing and Rating — H. C. Hardy
Sound Resulting from Vibration Due to Unbalance, Resonance, Critical Speed, etc. — R. J. Well
Application of Standards to Equipment — R. E. Parker
Techniques of Measurement of Sound Power Level of Unitary Equipment — R. N. Hamme
A Method for Estimating Octave Levels of Noise Generated by Air-Conditioning Systems — F. B. Holgate and S. Baken

9:30 a.m. SIXTH SESSION
Call to Order — Pres. P. B. Gordon
Performance Testing of Roof Ventilators, by J. J. Wannenburg
Jet Velocities From Radial Flow Outlets, by Alfred Koestel
Velocities and Temperatures on Axis of Downward Heated Jet From 4-Inch Long-Radius *ASME* Nozzle, by Rudiger Knaak
Report of Resolutions Committee
Unfinished Business
New Business
Adjournment

Golf Course at Manoir Richelieu

Lawn and Terrace of Manoir Richelieu

Moisture in Heat Transmission Through Building Materials

By N. B. Hutcheon,* Ottawa, Ont., Canada

Fifty years ago it was barely possible to begin to estimate the heat transmission through building sections. Today such calculations are made on a routine basis in the estimation of heating and cooling loads. Since the theoretical basis for such calculations is relatively simple and has long been known, it must be admitted that the major factor in this improved situation has been the availability of suitable data on the heat transmission coefficients of building materials and building sections. Chapter 9 of the ASHAE GUIDE which provides such data is probably the most widely used chapter in THE GUIDE. Important and useful as this chapter is, it has had to be based upon thermal conductivity data obtained from dry materials, whereas, in practice, materials will seldom be completely dry and on occasion may be very wet. The only data given for moist materials are for soils. This must be considered as a serious weakness and deserves most serious consideration.

The effects of water in materials upon the flow of heat through them have been disregarded, not because they are not important, but because they are so involved that as yet they cannot readily be described in any rational way which can be used in practice. It is for this reason that all conductivity testing of materials in the Laboratory is carried out on dry samples. The introduction of water brings in variations which are, in part, peculiar to the conditions of test and may make it difficult, if not impossible, to interpret or even to compare results.

Calculations of heat transmission made on the basis of dry materials need not always be seriously in error when applied to cases in which moisture is present. They are probably sufficiently accurate for a large proportion of practical cases. It is not possible, however, with present knowledge to predict in any precise way just when and to what extent the presence of water needs to be considered.

There are many people who regard a wet material as fundamentally little different from a dry one for purposes of heat transmission and who consider that all that is necessary is to determine a suitable new k value to apply to the material at a particular moisture content. This can be done quite readily for fully saturated materials. However, in the majority of practical cases the materials will not be saturated and under the temperature gradient which produces heat flow the moisture will begin to migrate by a process of evaporation and condensation. Not only does this migration result in a redistribution of the moisture content which in itself introduces a complication, but very substantial quantities of heat may be taken up during evaporation within the material to be carried in the vapor and given up only upon condensation at some other point along the flow path. This mechanism, although driven by the temperature gradient and inextricably combined with the heat transmission, does not obey the simple laws of heat transmission. It is, therefore, not rational to use the device of higher k values for various moisture contents except as an approximation in those cases where the contribution to heat transmission provided by the vapor flow is proportionately small.

For certain kinds of homogeneous walls the heat flow may be increased by a factor of 3 due to wetting produced by weather conditions. In the case of soils it has been shown that wet soils may have apparent k values several times greater than the corresponding dry soils. Heat flow through fibrous and other light insulating materials may be relatively little affected by moisture under most conditions since the most serious effects of the presence of moisture will be experienced during the redistribution of the moisture by evaporation and condensation which can, because of the porous nature of such materials, take place rather quickly. However, quite significant effects are to be expected under daily cycles of temperature in which the moisture may be caused to move back and forth within a wall, as under summer heat gain conditions.

The desirability of research on moisture migration, and specifically on those phases involving thermally actuated migration which are unavoidably involved in most cases of heat transfer in moist materials, will readily be acknowledged by many. The problem of getting it done is another matter. What is required is fundamental work of a difficult and time-consuming kind. Immediate results of direct application are not to be expected and yet this work must somehow be done if a very awkward and serious gap in our technology is to be bridged. Financial support for such work, based on the long view, will have to be found.

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*Vice Chairman, ASHAE Research Technical Advisory Committee on Insulation.

Cleaning of Industrial Effluents

Industrial air cleaning devices are in extensive use today, removing the contaminants to varying degrees as they are confined and conveyed to the collector by local exhaust ventilation systems. THE ASHAE GUIDE lists the basic objectives for equipment installation as:

1. Prevention of public nuisance or health hazard.
2. Prevention of fire or explosion hazarc.
3. Elimination of re-entry of exhausted contaminants back to workroom.
4. Permit recirculation of cleaned air to occupied space.
5. Salvage of usable material.

However, confining the subject to the in-plant industrial environment, only 2 of the factors have noticeable significance.

Re-entry of Contaminant to Occupied Space

If no air cleaner were employed, it would still be rare that the nature or concentration from an exhaust system could cause measurable increase in plant level concentration where material is discharged above adjacent roof lines. Speed of dispersion of fine particulates coupled with the extreme dilution which takes place does greatly reduce quantities that can be picked up by poorly located supply air intakes or returned through open windows or doors by turbulent winds and eddy-currents.

Installation of industrial air cleaning equipment will be made less frequently for this purpose than any of the other motivating reasons outlined before. It does, however, play an important part where highly toxic materials are involved.

However, removal of stack or exhaust system effluents can significantly reduce load on supply air filtration equipment with attractive reduction in service cycle for the air filter equipment.

Return of Cleaned Air to Workroom

Emphasis on return of cleaned air from industrial air cleaners is receiving increased attention. Current trends predict more general use of recirculated cleaned air with the order of cleanliness dictated by permissible in-plant concentration levels.

JOHN M. KANE — manager of Dust Control Products, American Air Filter Co., Inc., since 1950. Received B.S. in M.E., University of Kentucky. Member TAC on Industrial Environment. Lecturer at New York University, Air Pollution Graduate School Course. Member many committees and organizations working in field of industrial dusts. Licensed professional engineer, Kentucky.

The economics of recirculated air are substantial:

Heat Loads. Fuel bills can be substantially reduced. With ever increasing use of local exhaust ventilation to improve plant working conditions, exhaust volumes quickly reach 100,000 cfm and in larger plants will frequently be measured in millions of cubic feet per minute. North of the Ohio River, fuel costs to heat 100,000 cfm outside air can range from $5,000 to $12,000 a year based on a 40 hour work week and dependent on geography and fuel used.

Cooling Loads. The trend toward cooling and humidity control of manufacturing space shows substantial increases each year. Rapid acceleration of the practice is predicted by many observers. Recirculation of substantial quantities of air presently discharged outdoors will be required before many plant managements will be able to justify the operating costs.

Symposium Paper

At the Symposium on Industrial Ventilation at the Chicago Meeting in February, a total of 5 papers was presented and discussed. This is Paper V in full. Two of the papers (II, IV) were published in February JOURNAL SECTION (pp. 241-50). The 2 remaining papers (I, III) are expected to appear in early issues.

Capital Expenditures. Recirculation of air can save industry substantial investment sums. Make-up air units need not be purchased; heating plant additions can often be by-passed or in new plant construction, size and cost reduced. With cooling loads reduced, cost of equipment and its installation tends toward an expenditure more readily justified from increased worker productivity.

National emphasis on community air pollution also highlights the economics of recirculation. To eliminate public nuisance or air pollution problems, more expensive industrial air cleaning equipment of high order of efficiency is often indicated. The added investment on such non-productive equipment can often be compensated for by savings where recirculation is practical.

Where to Recirculate

In considering feasibility of recirculation, carefully consider relative toxicity, concentration, particle size range, and quantities of air supplied for general ventilation or make-up for exhaust ventilation from processes where recirculation is not practical.

Toxicity: Give first attention to those effluents that are relatively non-toxic— operations where control is provided for better working conditions, elimination of nuisance to plant or equipment.

Particle Size: The larger the particle size, the more readily it can be removed with high efficiency by industrial air cleaners.

Concentration: The lighter the concentration, the lower the concentration of material escaping the air cleaning device and returned to the workroom.

Dilution. Where substantial air supply requirements exist in a working area, dilution of any returned contaminants will provide an attractive safety device.

Today, air from industrial exhaust systems is being recirculated from non-toxic processes such as metal, rubber, plastic finishing—machining, grinding, polishing, buffing; from woodworking and sanding, plating tanks, food and grain processing, pharmaceuticals, and a host of others.

It is unfortunate that many state codes either prohibit or discourage recirculation for any industrial exhaust system. Many of the reasons which prompted such restrictions at the time regulations were drawn no longer apply.

1. Exhaust systems are now extensively used for non-toxic material control for improved working conditions rather than only for health hazard elimination.
2. Industrial hygiene knowledge and use of that science permits accurate appraisals of resulting conditions today.
3. Industrial air cleaning devices have been greatly improved and their performance established.
4. Impressive backlog of installations substantiate that air cleaner performance can be maintained over operating periods extending into years.

Summary

With continued industry efforts toward optimum in-plant environment and good public relations, it appears to the author: (1) that the cleaning of industrial effluents from stacks will involve increasing application of industrial air cleaning equipment; (2) that the demand will be toward designs with highest order of removal efficiency; (3) that recirculation of cleaned air to working space is practical for many of industry's problems; and (4) that recirculation will be used much more extensively in the near future.

SPRING REGIONAL MEETINGS BEGIN

Under the regional plan for chapter operation each of the 7 Chapters Regional Committees holds a meeting each year. These are scheduled this year for March and May. Reports follow for the meetings held in Regions 2 and 7.

REGION 2 AT DETROIT

The meeting of the Chapters Regional Committee for Region 2 was held in the Junior Room at the Engineering Society of Detroit on March 11. Members of the committee or alternates from each chapter in the region were present while Regional Director P. J. Marschall, Chicago, Ill., presided. Morning and afternoon sessions were held.

At a luncheon session, First Vice Pres. E. R. Queer, University Park, Pa., spoke on *What Are Our Future Energy Resources?* At the afternoon session, John Richmond, Cleveland, Ohio, was elected to be a member of the Nominating Committee, while D. S. Falk, Detroit, Mich., was elected first alternate with B. M. Kluge, Milwaukee, Wis., as second alternate. Twenty-eight members were present at the committee meeting for which J. B. Olivieri, Detroit, Mich., acted as secretary.

In the evening, a meeting of the Detroit Chapter was held which was attended by the Chapters Regional Committee. The chapter and the committee members were guests of American Blower Corp., at a dinner and tour of their Tireman Plant. The dinner meeting of the chapter was attended by 150 members and guests who had the pleasure of listening to Pres. P. B. Gordon, New York, N. Y., give his address on the subject *Our Bottleneck — Technical Know How.*

Vice president of the Detroit Chapter, P. S. Hosman, had charge of the arrangements for the chapter meeting which was presided over by Council member J. N. Livermore, who is also president of the Detroit Chapter.

REGION 7 AT OTTAWA

Under the chairmanship of Regional Director W. G. Hole, Montreal, Que., Canada, the meeting of the Chapters Regional Committee for Region 7 was held at Ottawa, Ont., Canada on March 13. Thirty were in attendance and all chapters in the region were represented by members or alternates of the committee. Present also was J. H. Ross, Toronto, Ont., Canada, member of the Council, and also Second Vice Pres. A. J. Hess, Los Angeles, Calif.

During the session also, D. W. Thompson, Vancouver, B. C., Canada, was elected as member of the Nominating Committee; A. K. Pierce, Winnipeg, Man., Canada, was elected first alternate; and J. Klassen, Ottawa, Ont., Canada, was elected second alternate.

As the closing event on the morning session, N. B. Hutcheon, assistant director, Division of Building Research, National Research Council, Ottawa, Ont., Canada, and member of the Committee on Research of the Society, spoke on the subject *Research Activities and Facilities in Canada.*

At the noon luncheon session, J. H. Fox, Montreal, Que., Canada, spoke on the subject *Observations and Comments of a Past Regional Director.*

A feature of the afternoon session was a tour of the Building Research Centre, conducted by Dr. Hutcheon. On completion of the tour, a conference room was made available at the Centre and there, Pres. P. B. Gordon, New York, N. Y., spoke on the subject *Our Bottleneck — Technical Know-how.*

In the evening, the Ottawa Valley Chapter met at the Prescott Hotel in Ottawa where an attendance of 150 people were on hand to listen to the feature talk on the subject *Activities and Developments in Northern Canada* by Maj.-Gen. H. A. Young, Deputy Minister of Public Works.

Society Officers' Activities

As usual at this time of year, Society Officers find it necessary to devote considerable time to traveling to regional meetings and also to represent the Society at various functions.

Recently Pres. P. B. Gordon, New York, N. Y., attended the Executive Committee Meeting of Engineers Joint Council in New York. He also was present at the Regional Meeting of Region 2 in Detroit and at Region 7 in Ottawa. At both of these meetings, his talk was a feature on the program.

First Vice Pres. E. R. Queer, University Park, Pa., attended and spoke at the Region 2 meeting in Detroit and also represented the Society at the Nuclear Energy Conference held in Philadelphia.

Second Vice Pres. A. J. Hess, Los Angeles, Calif., attended the Region 7 meeting at Ottawa.

Past Pres. John W. James, Chicago, Ill., gave the principal address on the occasion of the groundbreaking ceremonies held in Johnstown, Pa., when the new $1,000,000 Research Park Engineering Center of National-U.S. Radiator Corp. was started. It is expected that this Center will be completed in early 1958.

Alexander Luck Honored at Reading

A most unusual honor has come to Life Member Alexander W. Luck, Reading, Pa. He was chosen as *Engineer of the Year* by the Reading Chapter, *Pennsylvania Society of Professional Engineers.* The honor was bestowed on Mr. Luck at a meeting held at the Wyomissing Club in Reading on February 13.

At that time, Mr. Luck was approaching his ninety-fourth birthday having been born in London on November 1, 1863.

Mr. Luck is a long-time resident of Reading, Pa. and planned and installed heating installations in many well-known buildings in Eastern Pennsylvania, including a concealed heating system in the reerected Washington Headquarters Building on Valley Forge, Pa.

Mr. Luck became a member of the Society in 1919 and was made a Life Member in 1934. In addition to being a member of the Society and of the Reading Chapter of *PSPE*, Mr. Luck is also a member of the Engineers Club of Philadelphia.

Journal Section

Oil Burning Conference Postponed

The Commercial Industrial Sections of the Oil Heat Institute of America, Inc., have announced the indefinite postponement of the 3rd Annual Oil Burning Equipment Conference which was scheduled to be held at New York University, April 15-17th.

Professional Income of Engineers

A Special Surveys Committee of *Engineers Joint Council* has recently prepared Report No. 102 under the title *Professional Income of Engineers* 1956. This report is the second triennial report on this subject and is the result of data obtained by the questionnaire method. The sample is broader than in the earlier reports on this subject, since it represents data on a total of nearly 108,000 engineers out of the estimated engineer population of approximately 625,000. Copies of this report at $1.50 per copy are available direct from *Engineers Joint Council*, 29 West 39th St., New York 18, N. Y.

ASTM Thermal Conductivity Symposium

As a part of the *ASTM* spring meeting, a symposium on Thermal Conductivity was one of the well-attended sessions.

Included among those members of the Society taking part were C. B. Bradley, Manville, N. J., who served as sessions chairman, and A. G. Wilson, Ottawa, Ont., Canada; Prof. F. A. Joy, University Park, Pa.; D. D'Eustachio, Port Allegany, Pa., member of the Society's Committee on Research; and R. E. Schreiner, Port Allegany, Pa. These members were authors of papers presented.

Air Conditioning Noise Control Featured in Magazine

The monthly magazine *Noise Control* is published by the *Acoustical Society of America*. The January 1957 issue of this publication is taken up to a large extent with a series of articles dealing with various phases of noise control in heating, ventilating and air-conditioning systems. The authors of several of the articles are either members of the Society or active on Society committees. Among them are R. D. Tutt, New Britain, Conn., and R. D. Lemmerman, Baltimore, Md.; also C. H. Allen, Cambridge, Mass., member of the TAC on Sound and Vibration Control.

Mr. Tutt describes a new theory for the evaluation of noise components in air distribution systems. Mr. Allen discusses noise from air-conditioning fans, and Mr. Lemmerman describes methods of reducing noise in air-conditioning and ventilation installations.

The material in the whole issue of the magazine can be considered as a statement of how matters stand in connection with the general subject as explained by writers close to the subject.

French Edition of Haines' Book

The well-known and much used textbook by Past Pres. John E. Haines on *Automatic Control of Heating and Air Conditioning* has been made available in a French edition. Translation is by J. Genevay and published through the Paris publishing house of Editions Eyrolles. It is believed that this thus becomes the only book in the French language which so fully describes American practices and American equipment in connection with the automatic control of heating and air conditioning.

Anderson Conducts Grand Rapids Courses

J. T. Anderson, East Lansing, Mich., is conducting a course in heat transfer which is one of four courses offered at the Michigan State University Continuing Education Center in Grand Rapids.

Dr. Anderson is active in Society affairs, having been president of the Western Michigan Chapter during 1954.

Proposed Coil Testing and Rating Code

A proposed Standard for Testing and Rating Forced Circulation Air Cooling and Air Heating Coils has been prepared by a joint *ASRE*-ASHAE committee.

Copies of the standard are available for review and comment from the ASHAE Standards Committee, 62 Worth St., New York 13, N. Y. Comments should reach the committee by June 10, 1957 in order to be considered in preparing the final draft.

Greenhouse Cooling

A bulletin of the Texas Agricultural Experiment Station, MP-163, dated February 1956 contains interesting information concerning the use of cooling in greenhouses. The type of cooling described is the wet-pad exhaust fan system, and experiments in its use have been under way at College Station, Tex., since 1949. It is stated in the bulletin that pilot installations made by commercial growers of florist and nursery crops in Texas show that this system reduces labor costs and increases the quantity and quality of crops produced each year.

Overall results are better market returns, improved working conditions and reduced water requirements. The bulletin contains information concerning the amount of air exhausted, which is placed at approximately 7 cfm per sq ft of floor space. It is also stated that the air should move through the wet-pad at a velocity of 150 fpm or that one sq ft of pad area should be provided for each 150 cfm.

The bulletin also contains information concerning the amount of water needed, pump capacity, and also information concerning the construction and placement of the wet pads. Suggestions are given concerning the operation of the installation, and illustrations show how this method has been applied to various greenhouses. The authors of the bulletin are A. F. DeWerth and R. C. Jaska, who are respectively, head, department of floriculture and landscape architecture; and assistant professor, department of agricultural engineering.

APCA Plans 50th Jubilee Meeting

Fifty years of progress in air pollution control. That is the slogan on which the 50th Annual Meeting of the *Air Pollution Control Association* is based. The meeting is to be held in St. Louis, Mo., June 3-5.

Being an anniversary meeting, the Association has planned it so that various technical engineering societies are sponsoring sessions.

By action of the Council, the Society is arranging for the program to be held on Monday morning, June 3rd, at the Jefferson Hotel. B. L. Evans, St. Louis, Mo., is moderator for the session. It is planned that 5 Society-arranged papers will be presented during the session. They include consideration of the problems of reducing public nuisances due to fine dust and also to methods of analyzing tests and controlling indoor odors. Other societies are arranging for papers which will cover many other aspects of the whole general subject of air pollution. All members of ASHAE who can arrange to do so are cordially invited to attend the meeting.

Flat Plate Solar Collector

In the *Proceedings* of the *Institution of Mechanical Engineers of Great Britain*, G. T. Ward has written a paper under the title Performance of a Flat-Plate Solar Heat Collector. The collector is one which was constructed at the University of Malaya in Singapore, and on it the author made studies with the idea of arriving at information which could be used for the design of such collectors in the tropics. The paper contains interesting information concerning the amounts of solar radiation at Singapore, as well as an analysis of the data obtained from the operation of the collector.

The paper shows a relation between the efficiency of the collector, the plate temperature and the rate of insolation for constant rates of flow for circulating water. Performance charts are included, whereby an assessment may be made of the practicability of using solar energy in the tropics for the production of heat and power. Especially interesting are discussions contributed by people whose work is well known in the field, including Dr. F. A. Brooks and Dr. A. Whillier. The paper is available as a separate pamphlet and for purposes of reference can be identified as 1955 — Vol. 169 — Number 55.

Building Cost Manual

This Manual has recently been made available, after having been compiled through the efforts of the Joint Committee on Building Costs of the Chicago Chapter of the *American Institute of Architects* and the Appraisers Division of the Chicago Real Estate Board.

It provides an overall, up-to-date acquaintance with the costs of construction of buildings of varying types. In the work's complete coverage of every phase of building costs, each building is described, detailed, and illustrated with photographs. The actual costs of the building broken down by trades are given, and then these figures are shown on the basis of square foot and cubic foot costs.

The Manual deals with construction costs of 150 different building types and includes introductory material on factors affecting building costs, estimating building costs, depreciation, and regional variations in building costs. It presents over 80 case studies of building type costs with all necessary data and photographs of several examples of each type. It also includes a photographic listing of older type buildings with reference to their modern equivalent to assist the appraiser in estimating the present replacement cost of these older buildings.

The book is 8½ × 11 in., 367 pp., cloth cover, and is available from John Wiley & Sons, Inc. (price $15.00).

ACTIVITIES OF SOCIETY CHAPTERS

The big chapter news this month is the charter meeting at Fort Worth. John W. James attended the charter meeting and also was guest speaker at a Northern Ohio meeting. Excellent programs on both technical and non-technical subjects were featured by the various chapters. Finally, there are a number of names figuring prominently in the news.

Fort Worth Becomes 67th Chapter

As the 67th chapter of the Society, the local member group at Fort Worth, Tex., formally received its charter on the night of January 29, 1957.

Present on the occasion was an enthusiastic crowd of nearly 150 including 65 from Fort Worth itself, with Dallas supplying over 60 more and with members also on hand from the Houston, Austin and San Antonio chapters.

Pres. John W. James presents charter of Fort Worth Chapter to C. Rollins Gardner, president of the local group. Later, President James spoke on the subject, *The Future of Air Conditioning and the Society.* Vice Pres. T. B. Romine, Jr., watches at left.

Adding to the success of the meeting was the presence of Pres. John W. James from Chicago, Past Pres. Reg. F. Taylor from Houston, and Regional Director D. M. Mills, also from Houston.

Not only did President James do the honors by making the formal presentation of the chapter, he also handed over the gavel, given to the new chapter by the recently chartered chapter at Quebec, Canada.

During the course of the meeting too, President James, Past President Taylor and Regional Director Mills all spoke on selected topics.

At the business session, By-Laws for the chapter were adopted and officers for the current year were elected as follows: President, C. Rollins Gardner; Vice President, T. B. Romine, Jr.; Secretary, J. K. Mattox, Jr.; Treasurer, C. L. Zahn; Board of Governors, H. E. Palmros and R. M. Williamson.

At the Fort Worth Charter meeting, Regional Director D. M. Mills, Houston, tells of *The Value of Chapter Membership.*

The Fort Worth Chapter is the seventh to be chartered within the state of Texas.

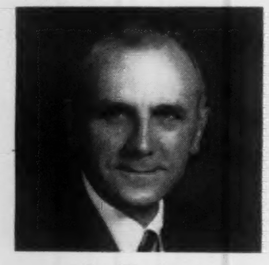
Speaking on *The Chapters' New Role in Society Operations* is Past Pres. Reg. F. Taylor.

James as Guest Speaker

The NORTHERN OHIO Chapter was honored by a visit from John W. James,

Journal Section

vice president, McDonnell & Miller, Inc., Chicago, at the end of his term as president of the Society. Guest speaker of the evening, Mr. James entitled his talk *Does Air Conditioning Provide a Healthful Indoor Environment?*



John W. James
Northern Ohio Speaker

Drawing an interesting analogy between the human body and a heating and cooling machine, he discussed the effect of noise, light and color on the human heat machine. Slides were then shown covering various environmental conditions and their effect on comfort. Mr. James closed by stating the purpose and objectives of ASHAE.

Technical Programs

C. W. Nessel, industry consultant, Minneapolis-Honeywell Regulator Co., Mt. Prospect, Ill., told an ARIZONA Chapter audience about the sequel to Austin Village, the area for air-conditioning experimentation. • • • At a joint meeting of *ASRE* and ASHAE chapters, BALTIMORE Chapter played host to the WASHINGTON Chapter of ASHAE and the Baltimore-Washington Chapter of *ASRE.* The guest speaker was J. H. Anderson, engineering manager, Turbo-Compressor Section, York Corp., subsidiary of Borg-Warner, York, Pa. Mr. Anderson spoke on *Centrifugal Refrigeration,* starting his discussion with the simple theory of centrifugal compressor refrigeration. He then described in detail the characteristics of several refrigerants, pointing out the advantages and disadvantages of each. • • • An excellent program on practical applications and misapplications of the various parts of steam and hot water heating systems was given at a BATON ROUGE Chapter meeting by W. H. Grant, Jr., manufacturers representative, New Orleans, La. • • • *Liquid Chillers* was the topic selected by a BLUEGRASS guest speaker, P. K. Barker, vice president, Heat-X-Changer Co., Inc., Brewster, N.Y. • • • CINCINNATI Chapter members heard J. W. M. Kreuttner, vice president, Buensod-Stacey, Inc., New York, N.Y., speak on *High Velocity Double-Duct Air Distribution.* In addition to his chalkboard work and description of experiences, Mr. Kreuttner supported his talk with a short movie. • • • On another occasion, the Cincinnati Chapter played host to *ASRE* at a joint meeting. First on the program was a coffee speaker, Ollie James, who maintained a great note of hilarity. On the more serious side, a talk was then given in the auditorium. J. E. Hutchinson, general sales manager, Dole Refrigeration Co., Chicago, Ill., spoke on *Ice Accumulation Systems as Applied to Air Conditioning.* His talk included information on equipment selection and installation compared with other air-conditioning refrigeration systems. • • • A tour of the Yale Design Laboratory and Gibbs Laboratory at Yale University was arranged for CONNECTICUT Chapter members and their guests. D. M. Hummel, manager, Division of Engineering, Yale University, department of business management, who is an ASHAE member, conducted the tour. • • • *Vibrations as Applied to Cork* was the topic of a discussion by W. A. Byars, Jr., chief engineer, Brown & Olds Plumbing & Heating Corp., El Paso, Tex. Mr. Byars addressed the EL PASO Chapter. He was assisted by a demonstration of a vibration balancing device by William Cook. • • • At a previous Chapter meeting, the El Paso members heard Jim Mays, Sporlan Valve Co., St. Louis, Mo., with Floyd Watts of the same company assisting. The topic of the program was *Thermostatic Expansion Valves,* and the talk was accompanied by some excellent slides. • • • A discussion of the California Walnut Growers Plant in Stockton, Calif., was featured at a GOLDEN GATE Chapter meeting. Dan Vandament, partner, Vandament & Darnsted, San Francisco, enumerated the problems involved in the design of this building. He told of the basis for selecting the cooling system installed. Mr. Vandament then introduced W. B. Ludwig, York Corp., San Francisco, Calif., subsidiary of Borg-Warner. He described the *Ammonia Absorption System for Air and Product Cooling.* Art Staat, Natural Gas Equipment, Inc., explained the problems involved in burning walnut shells as fuel for the boiler system. • • • Two speakers graced the ILLINOIS Chapter rostrum. W. C. Kadow, liaison engineer, Burgess-Manning Co., Chicago, and Raymond Nierzwicki, sales engineer, Airtite, Inc., spoke on the use, design and application of panel cooling. Mr. Kadow told of the general history of radiant panel cooling and its acceptance. The advantages of cooling panels, according to Mr. Kadow, are simplification of building design and furniture arrangement, and reduction in complaints from the occupants. Mr. Nierzwicki outlined the theory behind radiant cooling and presented design details and installation information. The speaker pointed out that a single zone system can be used with panel cooling. He further stated that this system is economically sound, but in making a comparison it is necessary to compare prices of complete installations, including the price of the acoustical ceiling. • • • R. T. Jaske, General Electric Co., Hanford, Wash., was a guest speaker for the INLAND EMPIRE Chapter. His talk concerned waste heat from atomic reactors and the possibility of commercial and industrial use of atomic energy. Mr. Jaske held his audience rapt when he mentioned that 3,000,000 cfm is the quantity of air required for ventilation and heating at the Hanford Works. Since pollution of air and the heating medium in the heat exchangers constitute a serious problem, absolute detailed engineering is required by the heating and ventilating engineer, and much more is to be considered in design than in the normal heating and ventilating job. Mr. Jaske concluded by saying that air-conditioning engineering design in an atomic reactor plant is in its infancy, with much to be learned. • • • A new concept in industrial controls was discussed by W. J. Denton, Westinghouse Electric Corp., Des Moines, Ia., at an IOWA Chapter meeting. Originally developed for automation of machines, this new concept, however, has no minimum or maximum limit of application. It is essentially a switching device which eliminates the need for switches, contacts, relays and moving parts. • • • The vice chairman of *ASRE,* Warren Clark, introduced a KANSAS CITY Chapter speaker, L. L. Hamig, partner, Ferris & Hamig, St. Louis, Mo. Mr. Hamig interpreted the relationship between the engineer, contractor and manufacturer. The speaker emphasized the importance of each person's playing his own role properly. • • • At a MANITOBA Chapter meeting, Charles Stokes, manager, Herman Nelson Division, American Air Filter Co., Inc., Louisville, Ky., used projected slides to illustrate his talk entitled *Super Test School.* Judging by the numerous questions from the floor, the presentation engendered considerable interest. • • • A moving picture on the *American Engineer* was shown at a MASSACHUSETTS Chapter meeting by Vice Pres. E. L. Blair. The Vice President also introduced J. M. Kane, chief engineer, Dust Control Division, American Air Filter Co., Louisville, Ky., who spoke on *Ventilation by Exhaust Hoods,* supplementing his presentation with a film. • • • C. M. Sanders, Jr., manager, Electronics Division, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., presented his program on *The Four Freedoms of Electronic Control* for the MEMPHIS Chapter. The program dealt with the versatility of electronic temperature control. Important points were the superior speed of response, versatility in thermostat construction, wide variety of applications of elements, and the advantage of simple supervision of controls from central control points. • • • *High Temperature Hot Water Installations* as applied to commercial and school buildings were discussed by P. H. Ziel, project manager, A. M. Kinney, Inc., Cincinnati, Ohio. At a MIAMI VALLEY Chapter meeting, Mr. Ziel checked high temperature hot water installations with comparable steam installations, and discussed the thermo-dynamic properties of each. Numerous slides were shown to illustrate typical installations. • • • A MICHIGAN Chapter speaker, Victor Cole, Carrier Corporation, Syracuse, N.Y., favored absorption refrigeration. He noted economies which can be affected by the use of absorption refrigeration cycle. Mr. Cole stated that the absorption refrigeration machine is particularly well suited for use in colleges, large industrial plants, and hospitals where exhaust steam or plant steam is available. Because of its light weight and lack of vibration, this machine is well suited for use on upper floors of buildings, according to the speaker. • • • *Pressurized Firing* was the topic selected by R. W. Pixler, vice president and general manager, Mettler Co., Inc., Los Angeles, Calif., when he spoke to the MINNESOTA Chapter. •

E. K. Campbell
Northeastern Oklahoma Speaker

• • MISSISSIPPI Chapter members viewed a film with the provocative title *Please Pass the Condensate—Steam Traps at Work.* • • • In a presentation on *Uses of the Solar Battery* at a NEBRASKA Chapter meeting, Gilbert Holmes, district manager, North Western Bell Telephone Co., demonstrated the solar battery by the use of 2 telephones. Mr. Holmes noted that solar battery development is proceeding to enable more useful energy conversion from the sun's rays. • • • An ASHAE member, D. R. Bachman, sales engineer, Minneapolis-Honeywell Regulator Co., Denver, Colo., gave his NEW MEXICO Chapter audience an interesting presentation including colored slides on *Automation in Building Air Conditioning.* • • • NEW YORK Chapter presented a program entitled *The Perimeter Duct System as Applied to Air Conditioning of Large Buildings.* The speaker was L. Economides, chief of design, Mechanical Engineering Division, Voorhees, Walker, Smith and Smith, New York, N.Y. He described the characteristics of the various perimeter systems and showed where each is best applied in different types of buildings. Mr. Economides' talk covered design, space requirements, zone control and arrangement. He answered numerous questions before the meeting was adjourned. • • • An open discussion followed a NORTH JERSEY Chapter program on the increase of kilowatt demands and the program contemplated to meet the demands. S. A. Moore, general manager of sales, Public Service Electric and Gas Co., Newark, N.J., gave a lengthy talk. • • • *Is Balancing Necessary?*—this question was posed and the answer given by W. L. Lipski, president, Engineered Air Balance Co., Dallas, Tex., at a NORTH TEXAS Chapter meeting. • • • The speaker for the evening at a NORTHEASTERN OKLAHOMA Chapter meeting was E. K. Campbell, chairman of the board, E. K. Campbell Co., Kansas City, Mo. Mr. Campbell gave an interesting illustrated talk on *Air Movement in Ventilation and Heating.* He discussed the discovery and isolation of the gases in air, requirements for comfort by ventilation, kinds of heating systems, use of fans to provide positive air motion, carbon-dioxide theory of air dilution, history of air distribution from central heating systems, and temperature control by using mixing dampers to throttle mixtures of recirculated and heated air. • • • Owen Kuhen, product manager, absorption refrigeration department, Carrier Corporation, Syracuse, N.Y., showed NORTHERN OHIO Chapter members and their guests a choice set of slides on absorption machines. This presentation, at a joint *ASRE-ASHAE* meeting was coupled with a lively question and answer period. • • • A guided tour of the air-conditioning installation of the R. J. Reynolds Tobacco Co., Winston-Salem, N.C., was scheduled by the NORTHERN PIEDMONT Chapter. Carl Vickers, project engineer for the company, made some preliminary remarks, describing the system, its method and various problems of installation. • • • The *Trend in Boiler Firing* was covered for an OKLAHOMA Chapter audience by L. S. Reagan, vice president and general manager, The Webster Engineering Co., Tulsa, Okla. Mr. Reagan noted the evils of over-controlling and discussed the trend in burners and controls with respect to old and new boilers. He showed several slides on modern burner stand-by firing. • • • An outstanding talk was given at an ONTARIO Chapter meeting by D. L. Lindsay, partner, Wiggs, Walford, Frost & Lindsay, Montreal, Que. The audience of 192 members and guests included 28 members of the University of Toronto Student Branch. Entitled *High Temperature Hot Water and Its Implications*, Mr. Lindsay's talk dealt chiefly with the high temperature hot water system at Camp Gagetown, New Brunswick. Considerable discussion ensued. • • • The Annual Open Forum held by OTTAWA VALLEY Chapter proved to be highly successful. A. S. Lawson, project engineer and general manager, Canadian Comstock Co., Ltd., Ottawa, Ont., outlined the bid depository system now being tried in Toronto. I. M. Paterson, branch manager, Johnson Temperature Regulating Company of Canada, Ltd., Ottawa, commented on such a system from a supplier's point of view. The contractor's angle was discussed by J. S. Massiah, purchasing agent, Edge, Ltd., Ottawa. No conclusions were drawn, but wide discussion was stimulated by Pres. D. W. Banton's decision to relax parliamentary procedures. The arguments continued until close to curfew. • • • On another occasion, Ottawa Valley Chapter heard Jack Spence, general manager, Interprovincial Utilities in Ottawa, give an enlightening talk on *Proposed Specifications as Related to Approvals and Inspections Policies and Programmes Governing Gas-fired Equipment Recommended by the Ontario Fuel Board and by the Canadian Gas Association.* This talk was doubly appreciated since natural gas is an unknown quantity in the Ottawa District, and Mr. Spence brought out several points that would be encountered when natural gas will be used in the area. • • • Acting as referee and umpire, E. W. Triol, program committee chairman, moderated a panel discussion on *Methods of Heating School Classrooms* for the PACIFIC NORTHWEST Chapter. The first speaker, R. M. Stern, partner, Stern & Towne, Seattle, Wash., ably presented the case for warm air heating. C. A. Pangborn, consulting engineer, Seattle, began by outlining the history of the development of classroom heating, and then described satisfactory results accomplished by a unit ventilator. The argument for radiant panel heating was given by E. L. Weber, consulting engineer, Seattle. The program was completed with a lively period of rebuttals and questions from the floor. •

John E. Haines
Rocky Mountain Speaker

• • The subject of *Low Velocity Air Diffusion* was treated by R. S. Geocaris, heating and ventilating engineer, S. J. Reynolds Co., Chicago, Ill., at a PHILADELPHIA Chapter meeting. • • • A three-part program was given at a ROCKY MOUNTAIN Chapter meeting. John E. Haines, past president of the Society and vice president, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., gave his brief talk, *What Is Air Conditioning?* Past President Haines pointed out instances where industries found that increased production more than offset the cost of installing air conditioning. The second part of the program was conducted by Joseph Antonio, chief, Mechanical Division, City of Denver, Colo., who presented color slides of actual fires in the Denver area. This demonstration emphasized the need for fire dampers and changes in mechanical systems, such as asbestos rather than canvas connections on fan systems, and a more thorough inspection and maintenance by property owners. The final section of the program was the display of a film on motor controls by C. M. McElroy, Denver branch manager, Cutler-Hammer, Inc., Milwaukee, Wis. The presentation simplified controls to 2 types, magnetic and manual, distinguishing the main differences between these. • • • Following a brief

Journal Section

W. O. Stewart

talk by R. T. Andrews on the testing and rating of *Power Roof Fans*, the SACRAMENTO VALLEY Chapter heard the guest speaker, W. O. Stewart, manager, Johnson Service Co., Los Angeles, Calif. Mr. Stewart spoke on *Recent Trends and Developments in Controls as Applied to Heating, Ventilating and Air-Conditioning Systems.* • • • A panel discussion held at a SOUTH CAROLINA Chapter meeting was moderated by C. W. Wrigley, manager, F. J. Evans Engineering Co., Columbia, S.C. R. K. Rouse, a member of the board of governors, introduced the members of the panel, who were L. L. Hyatt, mechanical contractor; Lucas Lafaye, general contractor; M. R. Durlach, Jr., consulting engineer; and W. E. Freeman, architect. Questions on various aspects of the heating and air-conditioning industry were presented to the panel. The resulting discussion was especially informative. • • • I. A. Naman, consulting engineer, Houston, Tex., addressed the SOUTH TEXAS Chapter on *Engineering Specifications and the Problems of Bidding*. The subject was considered highly appropriate, and the talk was well received by the audience. Among those in attendance were 7 past presidents of the chapter and 11 students from the Agricultural and Mechanical College of Texas. • • • At another South Texas Chapter meeting, R. W. Maze, regional sales manager, The Marley Co., Houston, Tex., told his fellow chapter members *What Most People Don't Know about Cooling Towers.* An interesting question and answer period followed. • • • *Fans, Their Performance and Selection* was the topic selected by a SOUTHWEST TEXAS guest speaker, S. J. Rohats, sales engineer, H. J. Dalton Co., San Antonio, Tex. The discussion covered the relative results of the 3 main types of fan blade inclinations (forward, radial and backward inclined blades), explanation and review of the relations of static pressure and velocity pressure in a duct system application of fan laws to system changes, avoidance of unbalanced operation of parallel fans and factors to be considered in fan selection. • • • At a VIRGINIA Chapter meeting, Charles Dverend, Koppers Co., Inc., Pittsburgh, Pa., delivered a talk on *Sound Attenuation.* • • • Enthusiastic reception was accorded a talk by G. D. Elmer, design engineer, Potomac River Naval Command, Washington, D.C. Mr. Elmer spoke on high temperature hot water at a meeting of the WASHINGTON, D.C., Chapter. He based his entire discussion on actual experience in the design, installation and operation of hot water systems. The speaker indicated that he felt that high temperature water was more economical than steam would have been in the installations described. Mr. Elmer capably replied to questions posed during the long discussion period following his speech. • • • Some of the latest thinking in the hot water heating field was discussed by a WESTERN MICHIGAN speaker, Frank Gall, sales promotion manager, Bell & Gossett Co., Morton Grove, Ill. Mr. Gall's presentation on *Characteristics of Forced Hot Water Systems* had 3 major divisions: air problems, matching pump to system, and locating of compression tank. Numerous questions were asked upon the conclusion of his presentation, followed in turn by some discussion of former practices *vs.* practices recommended by the speaker. • • • *Industrial Ventilation* was the subject of a panel discussion also held by the Western Michigan Chapter. The moderator, C. H. Pesterfield, who is a member of Council and professor of mechanical engineering, Michigan State University, East Lansing, Mich., made some preliminary remarks concerning Regional Area 2, of which he is regional director. The panel, consisting of W. C. Appledoorn, J. C. Barrett and K. E. Robinson, treated such points as the means which can be employed to conserve heat in a factory where a large volume of air is being exhausted and the best method of exhausting air from the kitchen of a commercial establishment. • • • An instructive discussion on *Liquid Chillers* was presented before the WESTERN NEW YORK Chapter by D. G. Merrill, Acme Industries, Inc., Jackson, Mich. This thought-provoking talk was well received by Mr. Merrill's audience. • • • At a joint *ASRE*-ASHAE meeting, WISCONSIN Chapter members and their guests totaled an audience of 160 persons. The speaker was R. A. Gonzalez, director of application engineering, Airtemp Division, Chrysler Corp., Dayton, Ohio. One of the main points covered in Mr. Gonzalez' educational talk on air-cooled condensing units was the differences in cost of operation of the various types of cooling equipment. Mr. Gonzalez concluded by saying that it is almost impossible to answer a prospect's question on the cost of operation, due mainly to the considerable variations from differing operating methods.

C. H. Pesterfield

Non-technical Programs

Students and faculty members from the University of British Columbia were special guests at a BRITISH COLUMBIA Chapter meeting. In a talk entitled *The Opportunities for Engineers in the Heating and Ventilating Field*, S. D. Peterson, branch manager of the Seattle office, Johnson Service Co., Seattle, Wash., outlined the vast opportunity open to engineers entering this field of endeavor. He explained that the heating and ventilating field is a growth industry, and that engineering graduates should keep in mind that the best opportunities available are in growth industry. • • • The Columbus superintendent of schools, H. H. Eibling, delivered a talk on *The Challenge to Education*, with the CENTRAL OHIO Chapter members and their guests as his audience. • • • GOLDEN GATE Chapter members, at a joint meeting with the Sacramento Valley Chapter as host, learned about *Common Stocks and Common Sense Investing.* The speaker of the evening was Robert Wilber, Sacramento manager, investment department, Sacramento Branch, Reynolds & Co. • • • A coffee speaker for the INDIANA Chapter, Alfred Maillard, treated *Heritage and Its Commensurate Responsibilities.* The main speaker, E. G. Williams, associate professor, Indiana University, Bloomington, Ind., told about *Developing Engineers into Managers.* • • • Before a MEMPHIS Chapter audience, James Farmer, Memphis Office, Collector of Internal Revenue, discussed allowable expenses and deductions in connection with engineering and contracting businesses. He placed particular emphasis on expenses allowable for out-of-town work, entertainment and traveling. • • • An impressive talk on the make-up of people was given at a PITTSBURGH Chapter meeting by J. R. Oliver. The speaker explained how different individuals should be treated in order to get along with them or sell to them. Mr. Oliver was complimented by several members for his splendid talk and method of presentation. • • • A brisk question and answer period followed a speech by Major Thomas Hunt, U. S. Air Force, at a SACRAMENTO VALLEY Chapter meeting. His subject was *Air Defense of the United States and Early Warning of the West Coast.* • • • A special meeting was called by the SOUTH TEXAS Chapter to vote on proposed changes in the chapter by-laws. Vice Pres. A. B. Ullrich, Jr., called for a vote on a motion to approve the amendments as written. The motion was passed. • • • VIRGINIA Chaper held its Annual Ladies Night with dinner and dancing.

Student Branches

Members of the NORTH CAROLINA STATE COLLEGE Student Branch and their guests heard an enlightening talk on *Electrical Controls* by Jay Johnson, Chet Adams Co. • • • At a business meeting held by the PURDUE UNIVERSITY Student Branch, Pres. G. T. Dollas outlined the possibility of more frequent meetings of the organization on campus to feature technical films available through the film library on campus. The suggestion was approved by the membership. • • • F. M. Watson, Honeywell Controls, Ltd., Toronto, Ont., informed the UNIVERSITY OF TORONTO Student Branch on the *Application of Controls to Heating, Ventilating and Air Conditioning.*

Names in the News

At a joint meeting of the BALTIMORE Chapter of ASHAE and the Baltimore-Washington Chapter of *ASRE*, W. G. Robertson, Jr., president of the ASHAE chapter, introduced P. R. Achenbach, who is chairman of the *ASRE* chapter and was general chairman of the Committee on Arrangements for the ASHAE Semi-Annual Meeting, 1956. Mr. Achenbach presented a resolution expressing regret and sorrow for the passing of R. S. Dill, an ASHAE Council nominee at the time of his death. • • • Presentation of a past president's pin was made to Cornelius Van Boeyen, BRITISH COLUMBIA Chapter, by C. W. Leek. • • • Robert Chipman of the Franklin County Chapter of *OSPE* was called upon at a CENTRAL OHIO Chapter meeting to discuss the operations and purposes of his organization. • • • Appointed by Pres. R. G. Anderson as a nominating committee for the CINCINNATI Chapter were A. H. Gerdsen, chairman, F. W. Wilson and R. C. Beineke. • • • EL PASO Chapter held an installation of the new officers for 1957: *President*—G. H. Jackson; *Vice President*—W. A. Byars, Jr.; *Secretary*—J. H. Brooks; *Treasurer*—J. A. True; *Board of Governors*—J. L. Huff, W. S. Cooke, Jr., and J. O. LeBeau, Jr. • • • At the following El Paso Chapter meeting, the appointments of committee chairmen were announced: *Membership*—F. A. Huchet, Jr.; *Program*—J. W. Lantow; *Attendance*—Cornelius Byl; *Publicity*—H. E. Taylor; *Finance*—R. O. Gibson; and *Special Events*—J. M. Beckford, Jr. • • • Pres. F. K. Crouch announced the appointment of J. E. Murray as GOLDEN GATE Chapter member of the Chapters Regional Committee, with K. F. Baldwin, Jr., as alternate. • • • A committee to review and rewrite the INLAND EMPIRE Chapter's By-Laws was appointed by Pres. Max Tonn. Headed by F. W. Jenkinson, the committee will consist of L. E. Marque, W. F. Kelly, R. E. Bozlee and F. C. Schulz. Also appointed was a nominating committee for 1957 headed by A. B. Hess, with L. E. Marque, F. W. Jenkinson, O. E. Bowers and Max Tonn as members. • • • A nominating committee was elected by MINNESOTA Chapter as follows: G. M. Kendrick, William Sturm, H. C. Mills, J. L. Hanson and E. F. Snyder, Jr. • • • Following his nomination by Pres. J. W. Doggett, Jr., D. F. Ingram was elected as MISSISSIPPI Chapter member, Chapters Regional Committee. F. H. North was elected as alternate. • • • A NEW MEXICO Chapter nominating committee was appointed, consisting of R. P. Lee, chairman, D. J. Braid, Jr., and W. L. Jones. • • • The function of the regional meeting was explained to the NORTH JERSEY Chapter by John Everetts, Jr., regional director, Regional Area 1. The chapter members also heard an announcement that their nominating committee would consist of H. M. Patrick as chairman, and F. H. Faust and Herbert Fox as members. • • • Incoming Pres. G. H. Meffert introduced the new officers of the NORTH TEXAS Chapter: *Vice President*—Ross Zumwalt; *Secretary*—J. D. Poythress; *Treasurer*—O. H. Mehl; *Board of Governors*—R. L. Patton and R. M. Kilpatrick. He also presented the new committee chairmen: *Program*—C. F. Gilmore; *Publications*—R. M. Baker; *Membership*—W. P. Glancy; *Publicity*—B. F. Farrar, Jr.; *Attendance*—A. R. Hundley, Jr.; *Hospitality*—R. S. Sandifer; *Technical Advisory*—R. E. Miller; and *Parliamentary*—J. R. Dowdell. The outgoing president, H. G. Gregerson, presented a briefcase to President Meffert for his use while in office. Past Pres. J. A. Ray presented a past president's pin to Mr. Gregerson. • • • Unanimously elected by the NORTHERN PIEDMONT Chapter was the following new slate of officers for 1957: *President*—C. A. Cofer; *Vice President*—C. E. Amick; *Treasurer*—W. H. Cooper; *Secretary*—Boleslaw Jeglinski; *Board of Governors*—C. C. Donovan and G. B. Rottman. Pres. L. R. Gorell thanked the members for their cooperation during his term of office. He received a rising vote of thanks for his splendid work as president during the year past. • • • OKLAHOMA Chapter's new nominating committee, appointed by Pres. F. R. Denham, includes R. E. Thomasson, chairman, and G. T. Donceel, J. H. Carnahan, A. H. Scott and Louin Tiller, members. • • • Pres. D. W. Banton, OTTAWA VALLEY Chapter, introduced J. H. Fox, regional director, Regional Area 7, at a meeting of the chapter. Mr. Fox, retiring as regional director at the completion of 2 three-year terms as a member of Council, volunteered his services to all who might require them in the future. At the same meeting, Secy. J. Klassen acknowledged a letter from N. R. Clark, bishop of James Bay, thanking the chapter for a donation of toys. • • • A Life Membership certificate was presented to G. M. Comstock by R. M. Toucey, president, PITTSBURGH Chapter. Mr. Comstock expressed his thanks and appreciation. • • • D. C. Jardine was honored at a ROCKY MOUNTAIN Chapter meeting at which he was presented his Life Membership certificate. • • • M. J. Delavan, SACRAMENTO VALLEY Chapter, was appointed representative to the Sacramento Valley Joint Engineering Council for a period of 2 years. • • • Elected as a SOUTH CAROLINA Chapter nominating committee were C. W. Wrigley, temporary chairman; H. A. Bruce, L. L. Hyatt, J. C. Harrison and F. W. Freeman, members; W. V. O'Neal and F. A. Bettis, alternates. • • • Several complimentary remarks were offered by the members at a WASHINGTON, D.C., Chapter meeting in reference to the good work being done by W. C. Reamy, member of the board of governors, in the publication of the chapter News Letter. • • • Pres. F. L. Murray, WESTERN MICHIGAN Chapter, announced the appointment of a nominating committee as follows: J. T. Anderson, F. W. Brundage, Frank Harbin, Jr., and S. M. Paganelli. • • • A tribute to the late O. D. Marshall, first president of the Western Michigan Chapter, was offered at a previous chapter meeting by H. D. Bratt. • • • Robert Jorgensen was officially appointed publicity chairman of the WESTERN NEW YORK Chapter for the balance of the year with a commendation for his work thus far. • • • Announcement was made at a NORTH CAROLINA STATE COLLEGE Student Branch meeting that Bobby Montague was appointed Society Engineer's Fair chairman. Those on his committee include Finley Pace, Jr., J. G. Daye and R. E. Moser.

CANDIDATES FOR MEMBERSHIP

Listed here are the names of 162 men who are candidates for membership, or advancement in membership grade.

Members are requested to assume their full share of responsibility of receiving these candidates into membership by advising the Executive Secretary before April 30, 1957 of any whose eligibility for membership is questioned. Unless such objection is made these candidates will be voted upon by the Council.

Note: †*Reinstatement* **Advancement*

California (*Region* 4)

Coles, D. D., Mgr. of Services, A-C & Refrig. Cooling Tower Div., Fluor Products Co., Whittier.

Dawson, R. S., Sales Engr. & Mfrs. Agt., Richard S. Dawson Co., Los Angeles.

Forkner, C. M., Owner, Charles Forkner, Drafting Service, N. Hollywood.

Gahafer, T. E., Sales Engr., General Controls Co., San Francisco.

Jarvis, H. W., Sales Prom. Advertising Mgr., Recold Corp., Los Angeles.

Kevany, M. J., Sales Engr., Western Air & Refrigeration, Inc., Los Angeles.

Knowles, J. A.*, Vice-Pres., United Air Conditioning Corp., Los Angeles.

Littleton, J. W., Sales Engr., Secy.-Treas., Norman Brown Co., San Francisco.

Mills, R. G., Owner, Drafting & Estimating Service, Sonoma.

Phillips, R. C., Sales Engr., Tennity & Co., Los Angeles.

Connecticut (*Region* 1)

Cole, R. F., Field Engr., The Colonial Blower Co., Plainville.

Kennedy, P. V., Gen Mgr., Colonial Blower Co., Plainville.

Myers, R. G., Sales Engr., Johnson Service Co., West Hartford.

O'Brien, R. E., Field Engr., The Colonial Blower Co., Plainville.

Journal Section

Runyon, R. F., Mfrs. Repr., Augur, Jones & Green, West Hartford.

Georgia (*Region* 5)

Massey, Foster, Heat Pump Specialist, Westinghouse Electric Corp., Atlanta.

Illinois (*Region* 2)

Brown, E. J., Research Asst., University of Illinois, Urbana.

Burbine, W. A., Dir. of Htg. & A-C. Sales, Crane Co., Chicago.

Hall, F. L., Htg. Mgr., Booth & Thomas, Inc., Springfield.

Migdal, N. B., Graduate Asst., University of Illinois, Urbana.

Smith, R. B., Engrg. Prod. Mgr., American Air Filter Co., Inc., Herman Nelson Div., Moline.

Stearn, M. F., Vice Pres., Robert E. Hattis Engineers, Inc., Chicago.

Trimmer, D. L., Sales Engr., American Blower Div. of American Standard, Chicago.

Yahagi, H. H., Engr., Holabird & Root & Burgee, Archts., Chicago.

Indiana (*Region* 2)

Bodell, Cornell†, Chief Engr., Hall-Neal Furnace Co., Indianapolis.

Gaskill, W. H., Jr.†, Sales., J. Edwin Aspinall Co., Indianapolis.

Jerger, E. W.†, Assoc. Prof., University of Notre Dame, Notre Dame.

Young, A. F.†, Engr. Industrial Sheet Metal Co., Inc., Hammond.

Iowa (*Region* 3)

Carson, J. R., Draftsman, Frank L. Pulley, Cons. Engr., Des Moines.

Giberson, E. C., Owner, Elwood C. Giberson Co., Des Moines.

Kansas (*Region* 3)

McClure, M. M., Pres., Davidson Plumbing Service, Inc., Wichita.

Randle, G. L., Cons. Engr., Great Bend.

Kentucky (*Region* 5)

Kepler, K. E., Sales Repr., Covington.

Sartwell, R. A., Service Mgr., Unit Vtg. Dept., American Air Filter Co., Inc., Louisville.

Louisiana (*Region* 5)

Knight, L. B., Jr., Mgr., Plbg., Htg., & A-C. Dept., Crane Co., New Orleans.

Strahan, E. K., Jr., Vice-Pres., E. K. Strahan, Inc., New Orleans.

Whittaker, F. F., Jr., Sales Engr., Walter Bros. Co., Inc., New Orleans.

Louisiana (*Region* 6)

Boutte, C. W., Jr., Cons. Engr., Alexandria.

Doupe, C. B., Mech. Engr., Paul O. Rottmann & Assocs., Shreveport.

Massachusetts (*Region* 1)

Abbott, K. P., Vice-Pres., Jarvis Engineering Co., South Boston.

Ferguson, W. T., Pres., Anderson Products, Inc., Cambridge.

Michigan (*Region* 2)

Katzman, Maurice, Jr. Engr., Migdal & Layne, Detroit.

Morgan, Maletus, Shop Supt., J. Brodie & Son, Inc., Oak Park.

Olivieri, J. B.*, Cons. Engr., Detroit.

Peake, H. W., Owner, Portland.

Wells, W. E., Sales, National-U.S. Radiator Corp., Grand Rapids.

Minnesota (*Region* 3)

Bennett, L. T., Vice-Pres., A. H. Bennett Co., Minneapolis.

Benson, R. L., Com. - Indus. Sales Coordinator, Minneapolis.

Hastings, C. T.*, Sales Engr., American Blower Div., Minneapolis.

Pooler, A. L., Indus. Repr., Minneapolis Gas Co., Robbinsdale.

Rosenberg, E. D., Pres., Robar, Inc., St. Paul.

Sturgeon, A. M., Non-Resident Sales Repr., Minneapolis Gas Co., Edina.

Willis, L. L., Chief Engr., Govt. Prod. Div., Thermo King Corp., Minneapolis.

Missouri (*Region* 3)

Bjerkan, T. J., Owner, Combustion Equipment Co., Kansas City.

Burnett, E. L.†, Mgr., Chas. D. Jones Co., Kansas City.

Campbell, R. G., D. M. Allen Co., Kansas City.

Duemler, A. J., National-U. S. Radiator Corp., St. Louis.

Healy, J. S., Supvsr., Installation & Service, Gas Service Co., Kansas City.

Heidinger, R. C., Estimator, Connors Heating & Air Conditioning Co., St. Louis.

Niedermeier, R. E., Field Engr., Sporlan Valve Co., Kansas City.

Rosenquist, A. A., Sales Engr., General Electric Co., A-C. Div., Kansas City.

Trumbull, R. E., Asst. Mgr., Owens-Corning Fiberglas Corp., Kansas City.

Vogel, L. R., Sales Engr., C. L. McMichael Co., Kansas City.

Wagner, H. F., Mfrs. Repr., Wagner Equipment & Engineer Service, Kansas City.

Nebraska (*Region* 3)

Miller, R. J., Mgr. Htg. & A-C. Dept., United States Supply Co., Omaha.

Myers, R. B., Sales Engr., The Trane Co., Omaha.

New Jersey (*Region* 1)

Burns, R. O., Vice-Pres., Home Fuel Oil Co. of Ridgewood, Glen Rock.

Dodge, P. R.*, Engr., Herbert Fox, Cons. Engr., Newark.

Goldmann, K. F., Sales Mgr., M. Blazer & Son, Passaic.

Kowadlo, Leonard, Engr., Comfortair Co., Inc., Hackensack.

Pelosi, Samuel, Jr., Sales Engr., Warren Webster & Co., Newark.

Schlamp, W. A., Chief Engr., Fee & Mason Manufacturing Co., Inc., Manasquan.

Updergrove, C. D., Dist. Repr., Warren Webster & Co., Trenton.

New York (*Region* 1)

Blum, D. J., Engr., Joseph K. Blum, Mech. Engr., New York.

Boss, H. E.*, Asst. Regl. Mgr., Aerofin Corp., New York.

Carr, L. D.*, Secy.-Treas., Associated Thermal Products Inc., New York.

Crone, K. H., Dist. Sales Mgr., Gustin-Bacon Manufacturing Co., New York.

DeMarco, P. V., Sales Repr., American Radiator & Standard Sanitary Corp., Syracuse.

Escoffier, J. J., Repr., Warren Webster & Co., Thornwood.

Gerola, M. A., Mech. Engr., Ebasco Services, New York.

Greenfield, S. S., Dept. Head, Mech. Engrg., Parsons, Brinckerhoff, Hall & MacDonald, New York.

Kass, Marvin, Designer, Vitro Corp. of America, New York.

Keller, E. G., Chief Hydraulic Engr., Dunham-Bush, Inc., Brewster.

MacPhee, C. W., Asst. to Tech. Secy., American Society of Heating & Air-Conditioning Engineers, New York.

Massman, G. W., Jr., Chief Draftsman, St. John, Platt & Carlson, Buffalo.

Moran, T. H., Sales Engr., American-Standard Corp., New York.

Nuzzi, A. P., Estimator, Jamoco Air Conditioning Corp., Jamaica.

Rankel, R. A., Vice-Pres. in charge of Engrg., Associated Thermal Products Inc., New York.

Squassi, P. E., Cons. Engr., New York.

Udolf, G. A.†, Mech. Engr., Child & Scott Co., Inc., New York.

North Carolina (*Region* 5)

Johnson, J. H., Repr., Chet Adams Co., Raleigh.

Wasell, M. W., Cons. Engr., Wasell Engineering Service, Winston-Salem.

Ohio (*Region* 2)

Buckley, J. V., Mech. Engr., A. M. Kinney, Inc., Cincinnati.

Emley, W. E., Jr., Mech. Engr., National Advisory Committee for Aeronautics, Cleveland.

Hughes, G. W., Project Mgr., Hughes Simonson, Inc., Dayton.

Kemper, K. R., Mech. Engr., A. M. Kinney, Inc., Cincinnati.

McCabe, E. J., Pres., Mac Piping & Construction Co., Cincinnati.

Pickens, E. M., Mech. Engr., Dayton Power and Light Co., Dayton.

Oklahoma (*Region* 6)

Nettleship, L. C., Sales Engr., Dunham-Bush, Inc., Oklahoma City.

Pennsylvania (*Region* 1)

Hutton, D. J., Sales Engr., Allen-Bradley Co., Pittsburgh.

McGuckin, J. F., Mgr., Htg. Div., Philadelphia Gas Works, Philadelphia.

Smith, E. A.*, Br. Mgr., Johnson Service Co., Pittsburgh.

Warren, A. B., Sales Engr., Westinghouse Electric Corp., Sturtevant Div., Pittsburgh.

South Carolina (*Region* 5)

Colyer, C. M., Owner, Charles W. Colyer Co., Greenville.

Texas (*Region* 6)

Bain, T. C., Ind. A-C. Spec., Lone Star Gas Co., Dallas.

Bartos, J. G., Sales Engr., The Trane Co., Dallas.

Crook, W. B.†, Office Engr., Texas Refrigeration & Engineering Co., Dallas.

Drake, C. M., Jr., Pres., Drake Co., Inc., Fort Worth.

Eddins, E. E., Engr., Hillencamp Engineering Co., Jacksonville.

Love, C. L., Owner, Love Refrigeration Co., Fort Worth.

Mellor, C. E., A-C. & Htg. Engr., Lone Star Gas Co., Fort Worth.

Rhinefort, B. P., Mgr. & Owner, B. P. Rhinefort Co., Fort Worth.

Richardson, W. C., Service Mgr., W. E. Lewis Co., Fort Worth.

Seyster, C. E., Utilization Engr., Lone Star Gas Co., Dallas.

Slaughter, Lee, Mech. Engr., Wilson, Patterson & Assocs., Fort Worth.

Walker, M. T., Sales Engr., J. P. Ashcraft Co., Inc., Fort Worth.

Wofford, W. G., Jr., Sales Engr., The Trane Co., Dallas.

Zahn, C. L.*, Sales Engr., Minneapolis-Honeywell Regulator Co., Fort Worth.

Washington (*Region* 4)

Angel, R. H.†, Construction Supt., Johnson Service Co., Spokane.

Cain, R. F., Sales Engr., Johnson Service Co., Seattle.

Eisenhawer, J. F., Mech. Designer, Bouillon & Griffith, Seattle.

Hendron, R. H.*, Sr. Engr., H. E. Bovay, Jr., Spokane.

Hinea, R. W., Jr.*, Assoc., R. D. Morse Co., Seattle.

Miller, H. C., Cons. Engr., Whitson-Miller & Assocs., Tacoma.

Nuyens, F. G., Mgr., Thermo, Inc., Spokane.

Whitson, E. P., Partner, Whitson-Miller & Assocs., Tacoma.

Wisconsin (*Region* 2)

Ambrose, R. S.†, Sales Engr., Barber-Colman Co., Milwaukee.

Cook, B. A., Sales Engr., The Trane Co., Milwaukee.

Fenlon, L. G., Vice-Pres., Alfred Goethel Sheet Metal Works, Inc., Milwaukee.

Herrick, C. H., Asst. Sales Mgr., Sterling Inc., Milwaukee.

Miller, R. J.; Cons. Engr., Holland & Beseke, Milwaukee.

Poling, E. F., Repr., Jos. S. Babush Co., Milwaukee.

Thorne, J. F., Jr., Product Dvlpt. Engr., Inland Steel Products Co., Milwaukee.

Canada (*Region* 7)

Allen, J. C., Engr., Ventilating and Blowpipe Co., Montreal, Que.

ANGLAIS, FRANCOIS, Design Engr., Tasse, Sarault & Assocs., Quebec, Que.

BAHRYCH, WILLIAM, Jr. Engr., Karel R. Rybka & Assocs., Toronto, Ont.

BIRD, J. M.*, Pres., General Equipment, Ltd., Vancouver, B. C.

BOLTON, W. W., Appl. & Sales Engr., B. F. Sturtevant Co. of Canada, Ltd., Toronto, Ont.

CHALMERS, G. J., Gen. Sales Mgr., Ross Engineering of Canada, Ltd., Montreal, Que.

CHARLES, H. N., Sales Engr., Canadian Blower & Forge Co., Ltd., Ottawa, Ont.

FRASER, R. M.*, Mgr., Engrg. Dept., Fleming Pedlar, Ltd., Winnipeg, Man.

GRAY, G. A.*, Br. Mgr., Dunham Bush (Canada), Ltd., Ottawa, Ont.

HARLING, J. A., Htg. Sales, Crane, Ltd., Ottawa, Ont.

HURTUBISE, J. H., Engr., Johnson Temperature Regulating Co. of Canada, Ltd., Montreal, Que.

INNES, A. M., Chief Mech. Engr., Giffels & Vallet of Canada Ltd., Windsor, Ont.

JEPSON, S. B., Repr., Empire Brass Manufacturing Co., Calgary, Alta.

LAGACE, J. M., Partner, Leblanc, Montpetit & Lagace, Quebec, Que.

LATENDRESSE, J. M., Design Engr., McDougall & Friedman, Montreal, Que.

MAILLETTE, RICHARD, Dist. Mgr., Mark-Hot, Inc., Quebec, Que.

MARKS, J. E., Pres., Douglas Engineering Co. Ltd., Montreal, Que.

MITCHELL, W. H., Sales Engr., Carrier Engineering, Ltd., Calgary, Alta.

OTTEWELL, ED. Mgr., Marvel Stoker Products, Edmonton, Alta.

PATTERSON, J. P., Br. Mgr., Johnson Temperature Regulating Co., Calgary, Alta.

SAMPSON, F. A., Sales Engr., Darling Bros., Ltd., Ottawa, Ont.

VAN ITERSON, H. A., Design Engr., Nicholas Fodor & Assocs., Ltd., Toronto, Ont.

VINEN, V. E., Sales Mgr., Emco, Ltd., Calgary, Alta.

Argentina

WAISGLUZ, JAIME, Ind. Engr., Worktechnia, Buenos Aires.

France

O'CONNELL, A. F., Chief Engr., Societe Francaise Cargocaire-Minikay, Paris.

Sweden

OLSON, O. Hjalmar, Pres., AB Gustavsbergs Fabriker, Gustavsberg.

Switzerland

HUGO, H. L., Mgr.-Engr., Gebruder Lincke A.G., Zurich.

ZIEMBA, W. S., Br. Mgr., A. Eigenmann, Cons. Engr., Zurich.

Union of South Africa

DAVIES, C. D., Chief Works Engr., Felt & Textiles of South Africa, Ltd., Natal.

OBITUARIES

P. ALFRED CRONEY
Claymont, Del.

A past president of the Massachusetts Chapter, P. Alfred Croney, 73, died recently. Mr. Croney had retired as chief mechanical engineer, Public Housing Administration, Washington, D.C., in 1953. Following his retirement, he moved from his residence in Takoma Park, Md., to Claymont, Del.

P. A. Croney

Mr. Croney joined the Society in 1939 and became an active member. At the 51st Annual Meeting of the Society held in Boston, Mass., in 1945, he acted as chairman of the Registration and Reception Committee. He served on the board of governors of the Massachusetts Chapter, was vice president in 1946 and president in 1947.

Following preliminary education in Wilmington, Del., his birthplace, Mr. Croney attended Cooper Union and Columbia University, where he studied mechanical engineering. For several years beginning in 1925 he was a mechanical engineer with Day & Zimmerman, Inc., Philadelphia, Pa. From 1931-32 he designed mechanical equipment for the Industrial Reformatory at Chillicothe, Ohio, for the U. S. Department of Justice. In later years, he was in charge of plumbing, heating and heating plant design in Chicago, Ill., Minneapolis, Minn., and Milwaukee, Wis.

He was named assistant chief mechanical engineer of the Technical Division, U. S. Housing Authority, in 1938, and rose to chief mechanical engineer five months later. In this position, Mr. Croney was in charge of design of plumbing, heating and heating plants, as well as of all preliminary estimates.

Mr. Croney is survived by his son, Samuel.

JOSEPH L. CRUPPER, III
Washington, D.C.

Joseph L. Crupper, III, a member of the Society for seven years, died on February 4, at the age of 32. He had been with The Trane Co. in Washington, D.C., for several years.

Mr. Crupper was born in Washington and received his B.M.E. from George Washington University in 1949. After graduation he became associated with John G. Webster & Sons, Inc., Washington, D.C. He was a member of *ASME*.

Surviving is his wife, who lives at their home in Falls Church, Va.

FRANCIS B. FRAZEE
Austin, Tex.

Francis B. Frazee, 45, active in the affairs of the Austin and Southwest Texas Chapters, died suddenly on January 22, following a heart attack. One of the organizers last year of the Austin Chapter, he was working recently for their special schools committee. In 1955, he served as president of the Southwest Texas Chapter, culminating previous service as secretary-treasurer and vice president.

Mr. Frazee, born in New York, N.Y., traveled extensively in the course of his career. After attending Colgate University and the University of Buffalo, he became a field engineer in 1935 for National Gypsum Co., Buffalo, N.Y. During World War II he served the U. S. Navy, ultimately with the fourth service command, Atlanta, Ga. Following further field engineering experience in Jackson, Miss., he became the director of training, Industrial Training Institute, Chicago, in 1945, and later joined Westerlin & Campbell Co., also of Chicago. Mr. Frazee moved to Austin in 1950, associating himself with Calcasieu Lumber Co. At the time of his death he was connected with the K & M Supply Co. in Austin.

Surviving Mr. Frazee are his wife, Jo, two daughters and three sons. They will remain at their home in Austin.

RAYMOND MARTIN
Montreal, Que., Canada

The Society has been informed of the sudden death on January 30 of Raymond Martin, 52, sales manager, Heating Sales Divisions, Vapor Heating (Canada) Limited, Montreal, Que. Mr. Martin had been with that company since 1932. He joined the Society in 1937.

Mr. Martin, who was born in St. Octave de Metis, Que., received his B.A. from the Seminary of Rimouski, and an M.A. from the University of Montreal in 1929. While furthering his education in the heating and ventilating field, he maintained a position as cost accountant for a heating equipment manufacturer in Montreal.

He is survived by his wife, two daughters and two sons.

J. MORTIMER TRAUGOTT
Philadelphia, Pa.

J. Mortimer Traugott, a Society member since 1930, died at his home in Elkins Park, Pa., on January 9, following a brief illness. Mr. Traugott, who was 59, was president of Bryant Air Conditioning Corp., Philadelphia, Pa.

Born in Scranton, Pa., he attended North East High School and the University of Pennsylvania. After World War I service as an ensign in the U. S. Navy, Mr. Traugott sold heating equipment. He founded his company in 1923.

He held membership in the Engineers Club of Philadelphia, the *Pennsylvania Gas Association*, and several civic and social groups. Survivors include his wife, Sara; a son, J. Mortimer, Jr.; two daughters, Mrs. Claire Silverman and Mrs. Janet Davis; and five grandchildren.

(For most recent listing of Society committee personnel see Frontispiece, JOURNAL SECTION*)*

Regional Organization of Society Chapters

The 67 Chapters and 6 Student Branches in North America are divided into 7 geographical groups, and each group is designated as a Regional Area. A Regional Director (names listed below) is elected by the Society membership for each Regional Area. These 7 Regional Directors and the 2nd Vice President of the Society, acting as chairman, constitute the Regions Central Committee.

There is also a Chapters Regional Committee for each Regional Area, and the members and alternate members of each of these committees are listed below, with the Regional Director as chairman.

Regions Central Comm. A. J. Hess, Chairman	Regional Areas	Chapters Regional Committees		
		Chapter	Member	Alternate
No. 1 **John Everetts, Jr.** **Chairman**	Conn.	Connecticut (New Haven)	Walter Heywood, Jr.	Fritz Honerkamp
	Del., Maine			
	Mass.	Massachusetts (Boston)	W. G. Martin, Jr.	E. L. Blair
	Mass.	Western Massachusetts (Springfield)	A. M. Lovenberg	F. A. Ferraro
	N. H.			
	N. J.	North Jersey (Newark)	Martin Christesen	S. H. Nitzberg
	N. Y.	Central New York (Syracuse)	L. A. Childs	S. F. Gilman
	N. Y.	Empire State Capital (Albany)	G. G. Davis	R. B. Taylor
	N. Y.	New York	Albert Giannini	J. B. Hewett
	N. Y.	Western New York (Buffalo)	C. W. Stone	G. E. Kuhn
	Pa.	Philadelphia	E. K. Wagner	P. H. Yeomans
	Pa.	Pittsburgh	R. M. Toucey	E. H. Riesmeyer, Jr.
	R. I., Vt.			
No. 2 **P. J. Marschall** **Chairman**	Ill.	Illinois (Chicago)	H. G. Gragg	
	Ind.	Indiana (Indianapolis)	James Jackson	H. E. Anderson
	Mich.	Michigan (Detroit)	E. F. Glanz	
	Mich.	Western Michigan (Grand Rapids)	F. L. Murray	B. J. Walter
	Ohio	Central Ohio (Columbus)	R. A. Wilson	W. A. Schoonover
	Ohio	Cincinnati	R. G. Anderson	T. D. Reiley
	Ohio	Miami Valley (Dayton)	J. B. Rishel	R. B. Walcott
	Ohio	Northern Ohio (Cleveland)	H. R. Canoyer	J. A. White
	Ohio	Toledo	J. F. Guest	J. M. Groskopf
	Wis.	Wisconsin (Milwaukee)	H. W. Alyea	R. D. Rodwell
No. 3 **A. B. Algren** **Chairman**	Colo.	Rocky Mountain (Denver)	A. S. Widdowfield	L. L. DeLong
	Iowa	Iowa (Des Moines)	R. S. Stover	W. A. Schworm
	Iowa	Illinois - Iowa (Moline, Ill.)	R. L. Graham	W. W. Dodge
	Kan.	Kansas (Wichita)	T. L. Roberts	J. C. Mikesell
	Minn.	Minnesota (Minneapolis)	E. T. Erickson	Fred Vogt
	Mo.	Kansas City	S. C. McCann	J. E. Miller
	Mo.	St. Louis	N. J. Hubbuch	W. P. Norris
	Mont.			
	Neb.	Nebraska (Omaha)	M. F. Stober	F. P. Manchester, Jr.
	N. D., S. D., Wyo.			
No. 4 **W. O. Stewart** **Chairman**	Ariz.	Arizona (Phoenix)	J. B. Hoaglund	E. P. Maxwell
	Calif.	Golden Gate (San Francisco)	J. E. Murray	K. F. Baldwin, Jr.
	Calif.	Sacramento Valley (Sacramento)	V. W. Thornburg	M. J. Delavan
	Calif.	Southern California (Los Angeles)	H. F. Ulovec	W. J. Biggar
	Idaho, Nevada			
	Ore.	Oregon (Portland)	W. B. Hayes	W. R. Norte
	Utah	Utah (Salt Lake City)	R. V. Oliver	D. B. Holford
	Wash.	Pacific Northwest (Seattle)	E. W. Triol	M. W. McKinstry
	Wash.	Inland Empire (Spokane)	J. A. Doyle	Max Tonn
No. 5 **C. B. Gamble** **Chairman**	Ala., Fla.			
	Ga.	Atlanta	J. A. Marshall	J. S. Edgar
	Ky.	Bluegrass (Louisville)	W. J. Killian	O. J. Hill
	La.	Delta (New Orleans)	J. H. Maloney	I. M. Richardson
	La.	Baton Rouge	J. F. Naylor, Jr.	A. W. Holland
	Md.	Baltimore	W. G. Robertson, Jr.	R. E. Dressell
	Miss.	Mississippi (Jackson)	D. F. Ingram	F. H. North
	N. C.	Northern Piedmont (Greensboro)	C. A. Cofer	C. E. Amick
	N. C.	Southern Piedmont (Charlotte)	G. C. Garrett	W. P. Wells
	S. C.	South Carolina (Columbia)	J. E. McMurray	B. A. Leppard
	Tenn.	Memphis	G. B. Ramsey	H. H. Wilson
	Va.	Virginia (Norfolk)	D. C. Delinger	D. L. Gusler
	D. C.	Washington, D. C.	P. R. Achenbach	J. H. Broome
	W. Va.			
No. 6 **D. M. Mills** **Chairman**	Ark.	Arkansas (Little Rock)	J. W. Thompson	K. A. Pettit
	La.	Shreveport	J. S. Malahy, Jr.	
	N. Mex.	New Mexico (Albuquerque)	R. G. Merryman	J. K. James
	Okla.	Northeastern Oklahoma (Tulsa)	C. H. Dollmeyer	J. D. Ryan
	Okla.	Oklahoma (Oklahoma City)	F. R. Denham	W. R. Johnson
	Texas	Austin	A. C. Lagow	B. J. Barnhart
	Texas	El Paso	J. O. LeBeau, Jr.	M. D. Goodwin
	Texas	North Texas (Dallas)	G. H. Meffert	O. H. Mehl
	Texas	South Texas (Houston)	E. B. Appling	A. B. Ullrich, Jr.
	Texas	Southwest Texas (San Antonio)	D. T. Kern	O. A. Brynie
	Texas	West Texas (Lubbock)	B. C. Melanson	T. F. Sartor
	Texas	Fort Worth	C. R. Gardner	T. B. Romine, Jr.
No. 7 **W. G. Hole** **Chairman**	B. C.	British Columbia (Vancouver)	A. C. Martin	W. F. Keenan
	Man.	Manitoba (Winnipeg)	R. M. Fraser	H. F. Randall
	Que.	Montreal	D. L. Lindsay	H. G. S. Murray
	Que.	Châpitre de la Ville de Québec	P. J. Lamarche	Jean Veilleux
	Ont.	Ontario (Toronto)	C. L. Torry	Jack Thompson
	Ont.	Ottawa (Ottawa)	D. W. Banton	C. W. Watson
	Alta.	Northern Alberta (Edmonton)	W. C. Woods	P. M. Butler

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Modern $15,000,000 building now being erected on the north bank of the Chicago River between Wabash and Rush. It will include a plaza and scenic promenade along the river's edge.

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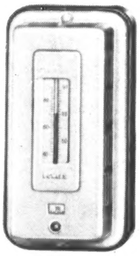
Air Conditioning throughout
America's most modern newspaper plant
will be regulated by a POWERS *Automatic temperature and humidity control system*



Symbol of Economy and Quality Control

High speed production of 120,000 newspapers an hour will be aided here by the combination of an outstanding modern building and the latest mechanical equipment designed for maximum efficiency.

In the building's ten acres of air conditioned space, Powers control will play an important role by providing ideal indoor weather for administrative offices, editorial, art, typesetting and engraving departments and pressrooms. Color Printing in close register especially demands the precise temperature and humidity control assured by a Powers system.

If You are Planning a New Building or remodelling an old one, ask your architect to include a Powers Quality system of temperature control. You will help insure utmost comfort and lowest upkeep cost.

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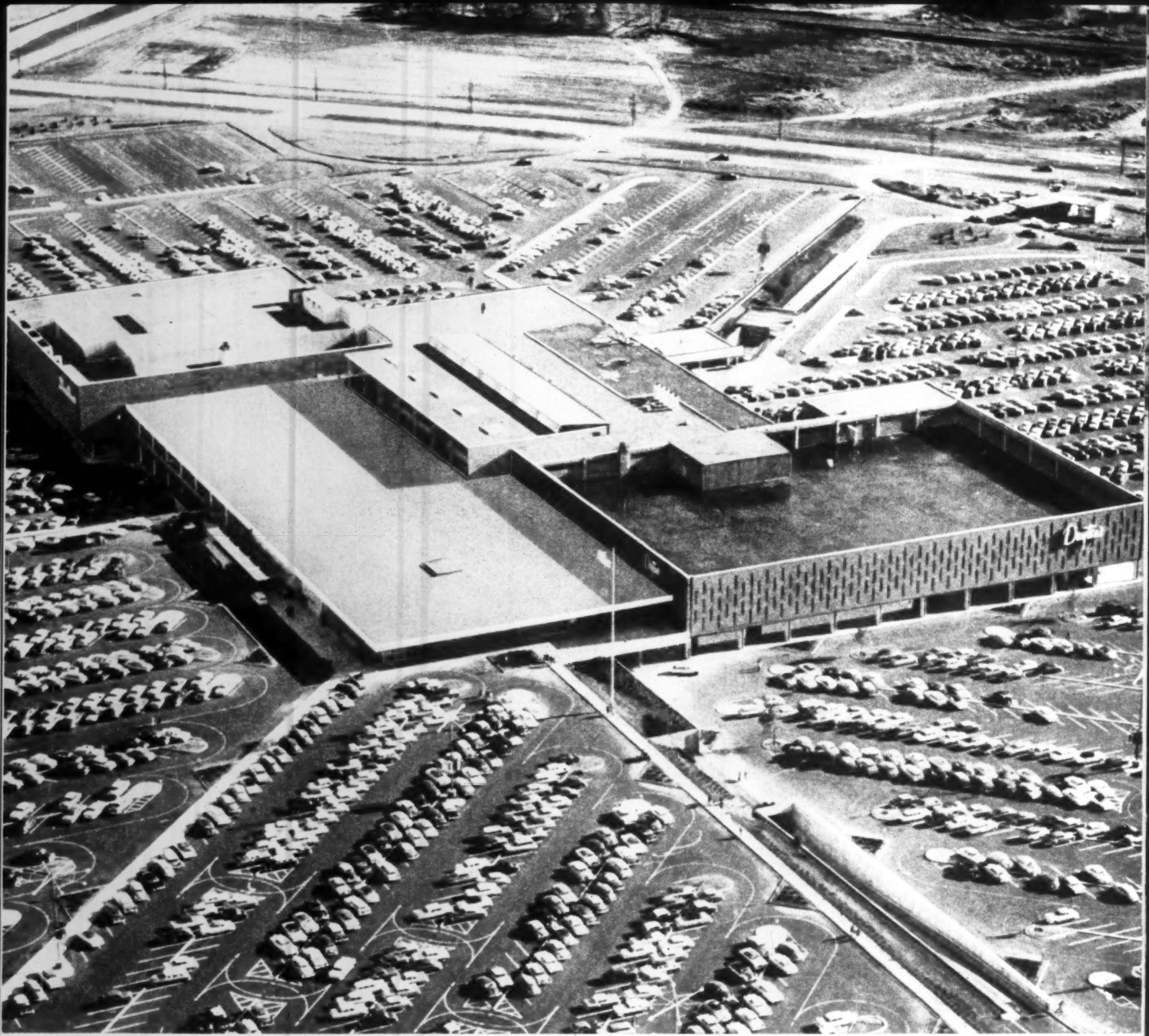
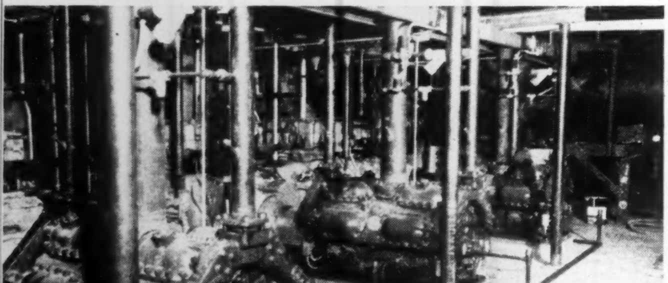
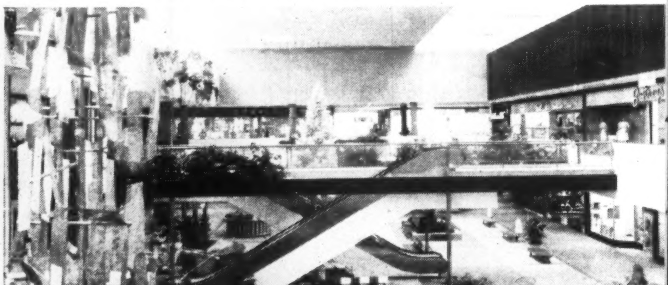


ULTRA MODERN SOUTHDALE Shopping Center, Minneapolis, Minn., includes year-round shopper's comfort—supplied by York heat pump. *Developer*—The Dayton Company, Minneapolis, *Architect*—Victor Gruen & Associates, Los Angeles, *General Contractor*—Johnson, Drake & Piper, Inc., Minneapolis.

HEART OF YORK HEAT PUMP is bank of five York 16-cylinder "Freon-12" compressors totaling 700 tons capacity. Over 70 stores and a huge enclosed Garden Court are automatically cooled in summer, heated as needed in winter by ingenious York system which saved builder, tenants $500,000.

DESPITE EXTREME NORTHERN SITE, outside air is pre-cooled during summer, pre-heated during winter to maintain constant temperature of 72°F for stores, giant indoor Garden Court (below) by York system. 50°F well water found 400 feet below Southdale is used to pre-cool all outside air delivered into Garden Court.





YORK® PRIOR PLANNING SERVICE controls air conditioning costs by early analysis of system needs

- Today, air conditioning systems often must provide precise indoor climatic control, season long, even year-long, reliability.
- Each system represents a major investment on which employee and client good-will depends, or which product quality demands.
- York's 5-point PRIOR PLANNING SERVICE assures precise technical data on system needs early in the planning stages to help consultants, architects, and contractors design a better system, eliminate costly changes later on.

Take any two buildings. Even twin buildings on opposite sides of a street. With identical air conditioning problems to be solved, the systems used may differ widely. That's why through York's Prior Planning Service, York stands ready to provide a comprehensive and detailed technical analysis of system needs. York's long experience and leadership in all phases of air conditioning assure you an accurate analysis of *all* factors which affect system design including:

- **heat load**
- **body load**
- **traffic conditions**
- **climate conditions**
- **temperatures required**
- **power availability**

Armed with this information, it is then possible to design a system that will meet the needs precisely . . . without unnecessary initial expense or costly changes later on.

Through Prior Planning Service, the York sales engineer brings to your air conditioning problem unparalleled experience. Recent buildings served by York include New York's Empire State Building, Denver's Mile High Center, Philadelphia's 3 Penn Center Plaza, San Francisco's Equitable Life Assurance Society Building, Miami Beach's Fontainebleu Hotel, Minneapolis' Southdale Shopping Center, and Chicago's Palmer House Hotel.

You may rely with complete confidence upon the good judgment and recommendations of the York engineer. Call him *early* in your planning, or write York Corporation, subsidiary of Borg-Warner Corporation, York, Pa. In Canada, Canadian Ice Machine Co., Toronto.

PRIOR PLANNING SERVICE works 5 ways

1. **EARLY ANALYSIS** gives you all the technical data needed to make decisions.
2. **PROPER SELECTION OF EQUIPMENT.** York supplies *all* types, can be objective in recommending the equipment that is right for the job.
3. **BEST USE OF TIME, MATERIALS.** York can help consulting engineers, contractors and architects on space, design specification problems, avoid costly changes later.
4. **INSTALLATION SUPERVISION.** When desired, York supervises system installation, tests and adjusts it, trains operators on how to utilize all of its outstanding capabilities.
5. **MAINTENANCE SERVICE.** When you specify York, a York Certified Maintenance Contract can also be specified assuring regular system inspection, 24-hour emergency service, all repairs, complete reports on the system's condition.

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Pittsburgh Superfine is applied to Rheem Heater panels. Superfine cuts standby heat loss, increases heater efficiency far above the 80% required by gas and oil companies.

Plant Manager Gordon Cheasley reports that Superfine saves production time and shipping costs, is safer to work with than previous insulating material.

"Thanks to Pittsburgh Superfine, Rheem heaters have the best insulation in the industry!"

says Mr. Gordon L. Cheasley, Plant Manager, HOME PRODUCTS DIVISION
RHEEM MANUFACTURING COMPANY, NEW CASTLE, DELAWARE

"The use of Pittsburgh Superfine helps Rheem five ways in the production of our heaters," reports Mr. Cheasley.

1. **Low heat loss—increased efficiency.** "Pittsburgh Superfine cuts the standby loss of heat in our units and has increased their efficiency to far above the 80% required for approval by gas and oil companies."
2. **Constant resiliency.** "We ship several models disassembled in cartons. Superfine is compressed for packing; yet after a year's compression time, Superfine 'bounces' right back to its original thickness."
3. **Faster production.** "Superfine's lightweight factor saves handling time. Cutting is done quickly and easily. One man can cut, place insulation on eight panels per unit, and pack 25 units a day for shipping."
4. **Safer to work with.** "The insulation material we previously used caused employees discomfort and skin irritation due to glass particles working loose. Superfine's superior quality eliminated this, ended complaints and raised employee morale."
5. **Lower shipping costs.** "Lightweight Superfine saves us 10 lbs. in total weight shipped per carton of panels . . . an important cost-saving factor."

Have you tried Superfine?

Pittsburgh Superfine is ideal for all types of heat and cold insulation, and for sound deadening, too. Get the complete Superfine story from your local PPG Sales Office, or write *Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Penna.*

PITTSBURGH SUPERFINE IS A PRODUCT OF THE FIBER GLASS DIVISION OF PITTSBURGH PLATE GLASS COMPANY

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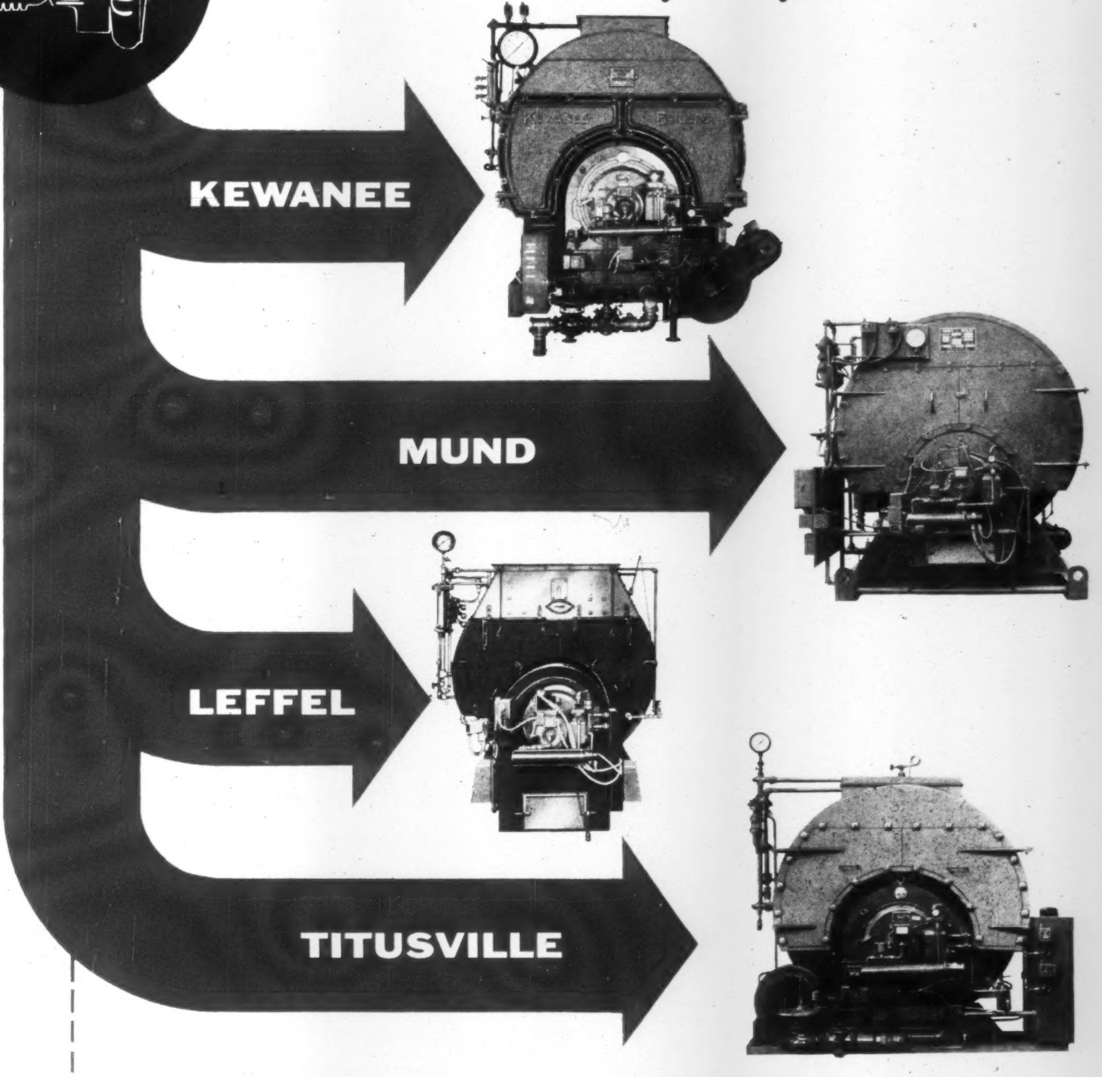
Here are some of the famous boilers fired by Ray Burners



You'll see Ray burners on most leading boilers in use today. That's because Ray's superior performance and engineering have proved in over 43 years of rugged field use, that there is no substitute for quality. Combine Ray's complete burner line—gas, oil and combination—with their world-wide dealer service organization and you have two reasons why Ray is first in sales.

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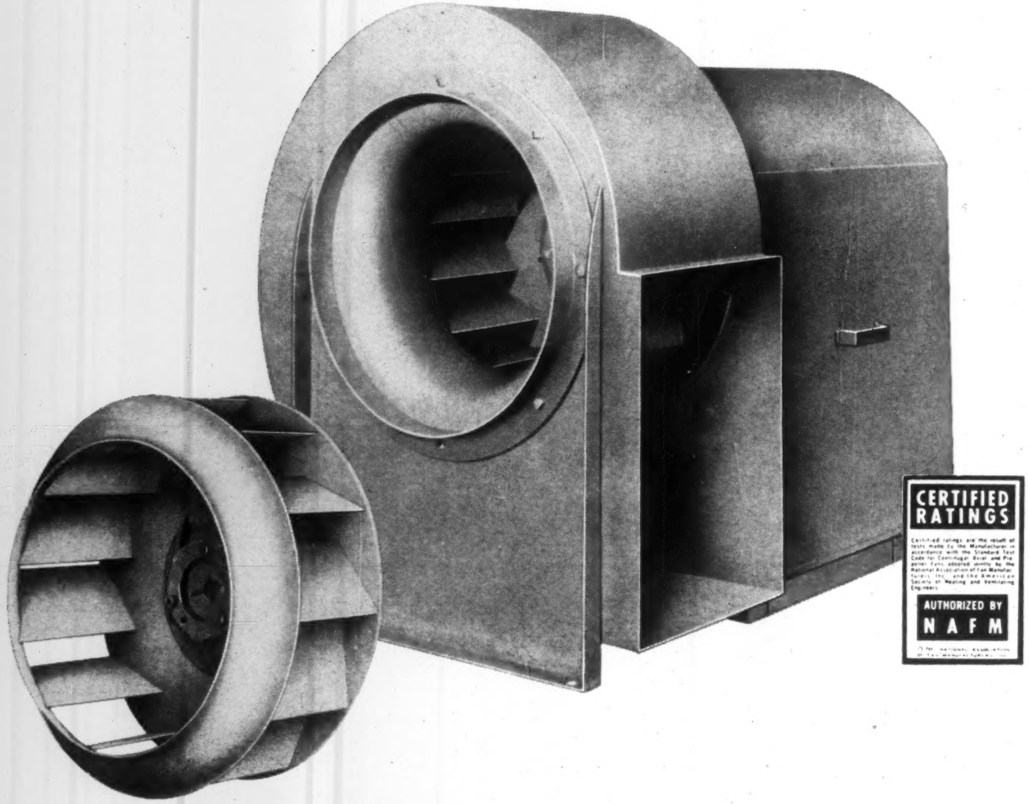


CERTIFIED RATINGS

Certified ratings are the result of tests made by the Manufacturer in accordance with the Standard Test Code for Centrifugal Axial and Propeller Fans adopted jointly by the National Association of Fan Manufacturers, Inc. and the American Society of Heating and Ventilating Engineers.

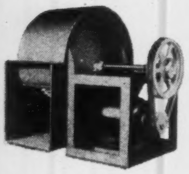
AUTHORIZED BY NAFM

Backward Curve Blowers—Certified Ratings

Completely Designed, Engineered and Manufactured by Peerless Electric

Peerless Backward Curve Blowers are all Peerless—motor and all. We control the entire production of this versatile blower, from drawing board to finished product. We guarantee it unconditionally for quiet, trouble-free operation.

Peerless Backward Curve Blowers can be specified with confidence. They are thoroughly tested according to test codes. They meet NAFM and NEMA standards. Scores of them are operating in schools, churches, hospitals and government installations.

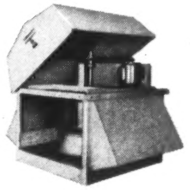


FORWARD CURVE BLOWERS

Made entirely by Peerless; arc-welded housings and frames; wheels designed for quieter operation; dynamically balanced.

CENTRIFUGAL ROOF VENTILATORS

Matching wheel cone accurately fits spun venturi for quieter, smoother air movement. All welded construction; material 16 ga. or over. Each unit air tested, and rated to assure certified PFMA ratings. Fits standard curbs.



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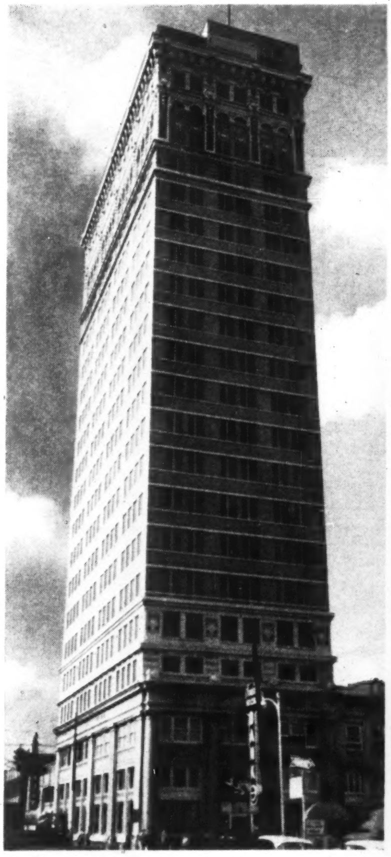
40 Tons OF REFRIGERATION SAVED!

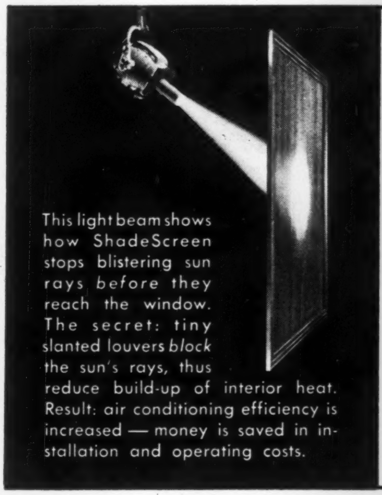
ShadeScreen's slanted louvers deflect solar heat away from Waco's Amicable Building to reduce the required air conditioning capacity by 12%.



"You just can't air condition it!" said many experts of the 44-year-old Amicable Building in Waco, Texas.

But today all 75,000 square feet of floor space are successfully cooled by just 287 tons of refrigeration — with a valuable assist from Kaiser Aluminum ShadeScreen. According to L. E. Overton, building manager, at least 40 more tons would have been needed if ShadeScreen had not been specified for the windows at the time when air conditioning was installed. In addition, ShadeScreen has eliminated harsh interior glare. Its clean architectural lines have added a distinctive modern touch to the facade. And its rust-proof permanency has assured virtually no upkeep.

Today, more and more customers are finding ShadeScreen the economical and practical answer to air-conditioning problems. Send coupon now for AIA catalog and complete information.



This light beam shows how ShadeScreen stops blistering sun rays *before* they reach the window. The secret: tiny slanted louvers *block* the sun's rays, thus reduce build-up of interior heat. Result: air conditioning efficiency is increased — money is saved in installation and operating costs.

TYPICAL EXAMPLE OF SHADESCREEN ECONOMIES

	Instantaneous Heat Gain BTU/Hr.	Refrigeration Saving in tons
4:00 P.M. Peak Load 23 West Windows, 3½′ x 6′		
Unshaded windows	111,000	
SHADESCREENED windows	34,800	
Heat Blocked by SHADESCREEN	76,200	6.35
10:00 A.M. Peak Load 24 East Windows, 3½′ x 6′		
Unshaded windows	69,500	
SHADESCREENED windows	17,650	
Heat Blocked by SHADESCREEN	51,850	4.31
12:00 Noon Peak Load 11 South Windows, 3½′ x 6′		
Unshaded windows	26,800	
SHADESCREENED windows	8,550	
Heat Blocked by SHADESCREEN	18,250	1.52
TOTAL TONS REFRIGERATION SAVED, 1 ton/12,000 BTU/Hr.		12.18

SHADESCREEN *
by Kaiser Aluminum

* Trademark—a louvered screening product made by Kaiser Aluminum

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Please send me complete information about Kaiser Aluminum ShadeScreen, including your AIA File Catalog. In addition, please send me the name of my nearest ShadeScreen supplier.

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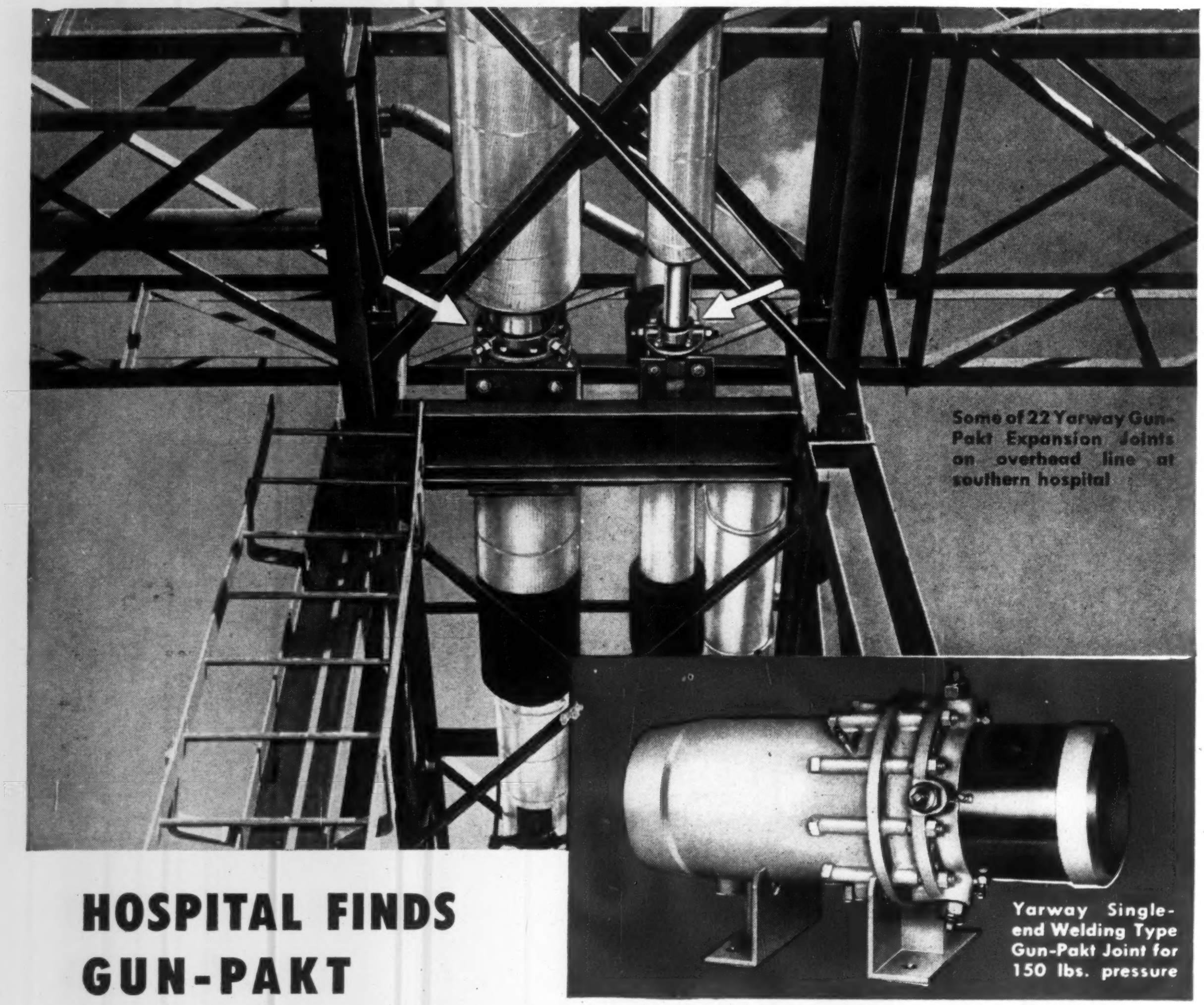

Some of 22 Yarway Gun-Pakt Expansion Joints on overhead line at southern hospital

Yarway Single-end Welding Type Gun-Pakt Joint for 150 lbs. pressure

HOSPITAL FINDS GUN-PAKT

SURE CURE FOR EXPANSION JOINT TROUBLES

YARWAY Gun-Pakt Expansion Joints are just what the "doctor" ordered for this overhead steam line at a large southern hospital—and he ordered 22 of them!

In institutions, industrial plants and other large steam distributor systems YARWAY Gun-Pakt Joints are growing in popularity.

YARWAY Gun-Pakt slip-type joints give long life—no fatigue failures.

You need *fewer joints per length of line*, with traverses up to 12″ single and 24″ double.

With Gun-Pakt joints packing may be added as necessary, *under full steam pressure right on the job—no unpacking, no shutdowns.*

There's also *lower pressure load on end anchors* because excessive strains are eliminated.

All these are reasons why it will pay you to "do as the doctor ordered"—look into YARWAY Gun-Pakt Expansion Joints. Write for Bulletin EJ-1914.

YARNALL-WARING COMPANY
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YARWAY **GUN-PAKT EXPANSION JOINTS**

another DUNHAM-BUSH PROFIT POINTER

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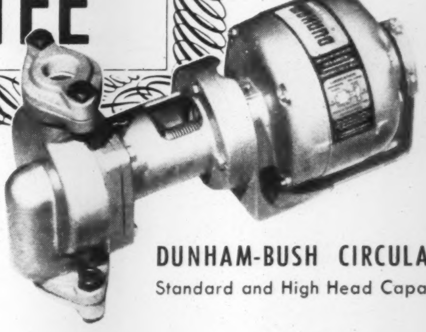

DUNHAM-BUSH CIRCULATOR
Standard and High Head Capacities

forget about stocking or replacing circulator couplings

Anyway you figure it, you're money ahead with Dunham-Bush Circulators.

The single spring Coupling in every Dunham-Bush Circulator is *guaranteed* for the lifetime of the Circulator. No "ifs", "ands" or "buts"—you just plain don't stock replacement couplings . . . don't have costly replacement "call backs". And that means more profit!

Circulator installation is quick and easy either in horizontal or vertical pipes . . . in supply mains or return lines . . . with six positions to fit any application.

And look at these additional profit-performance "proofs":

- *Vibration-proof* one-piece impeller
- *Water-proof* bearing lubrication section
- *Overload-proof* brand name motor

Insure your profit with these guarantees. Get details of the complete Dunham-Bush hot water line, now.

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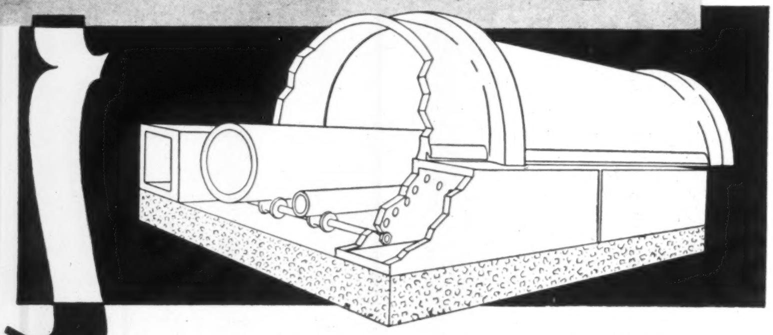
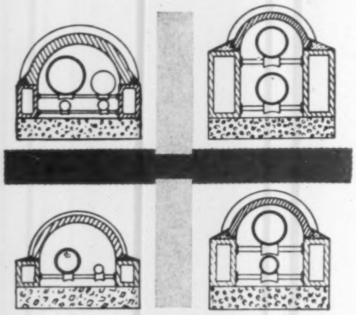
PERMANENT PROTECTION
for underground piping!

STILLWATER CERT-A-BAR* TUNNEL CONDUIT SYSTEM



New ceramic Cert-A-Bar Pipe Support Blocks eliminate the need for interior cast iron rests. The perforated block is laid as a structural support member at regular intervals, and the bars are simply inserted and locked in place.

THE vital consideration in selecting an underground conduit system is *permanent* protection . . . not for one year or five, *but for the life of the piping.* You get the best possible protection for your underground metal service piping with a Stillwater Conduit System of vitrified clay. It's chemically inert—can't rust, rot, corrode, or decay . . . ever. And it is manufactured in accordance with ASTM specification C-13-54, assuring proper strength and quality. Any combination of service piping can be protected. Conduit is available in a wide range of sizes, with a complete line of fittings and accessories, including alignment guides, lateral guides, and anchors. Any contractor's crew can handle the installation easily, or if you prefer, Stillwater Licensed Installers will assume the responsibility. The Cert-A-Bar Tunnel System can be installed with any of three suggested new waterproofing specifications —one for average conditions, one for intermittent ground water conditions, and a third for high water table conditions. It's the lowest-cost conduit per year of service that you can specify or install!



THE CERT-A-BAR SYSTEM HAS ALL THESE IMPORTANT ADVANTAGES

- Inherent structural strength for permanent protection
- Complete flexibility for design
- Minimum initial and long-term costs
- Quickly installed
- Keeps pipe insulation dry
- No electrolytic corrosion of piping
- No maintenance required

A few of the hundreds of possible combinations of piping for the Cert-A-Bar Tunnel System are shown at left.

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illustrated, four-page circular with complete installation specifications.

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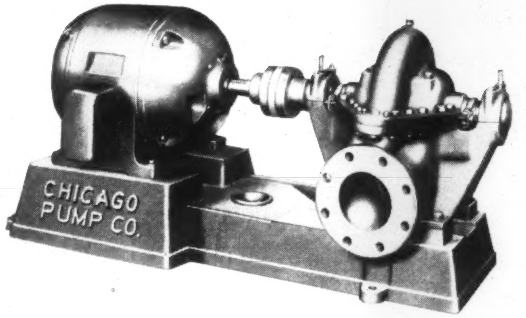
Chicago TOP QUALITY PUMPS

Engineered for plumbing, heating, and air conditioning systems

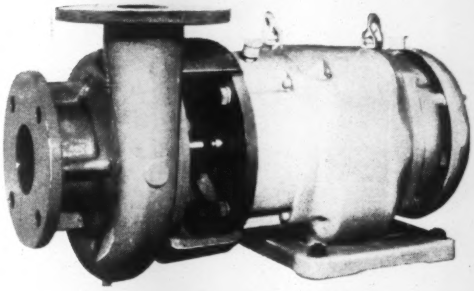


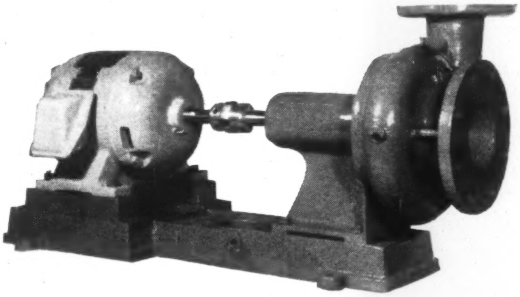
TYPE D DOUBLE SUCTION HORIZONTALLY SPLIT CASE PUMP

A rugged, heavy-duty pump that guarantees long, trouble-free service. The rotating assembly may be inspected without disconnecting the piping. Capacities up to 1900 G.P.M. Heads to 530 Ft. Described in Bulletin 101.

TYPE CC CLOSE COUPLED PUMP

Handles the toughest pumping jobs efficiently and in the least possible space. May be mounted in any position as long as the motor is not lower than the pump. Equipped with leak-proof mechanical seal. Capacities up to 500 G.P.M. Heads to 215 Ft. Described in Bulletin 108.





TYPE FC PEDESTAL MOUNTED FLEXIBLE COUPLED PUMP

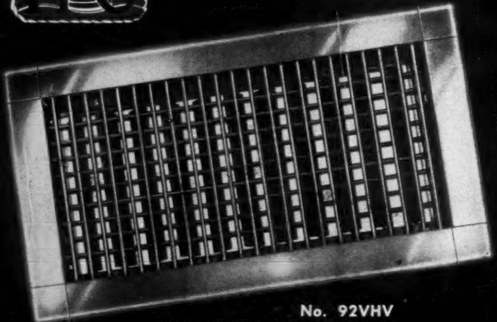
Like the CC, all FC pumps are equipped with the most reliable mechanical seal ever built into a pump. Ceramic-faced stationary seat is highly resistant to wear. Accurately lapped surfaces and automatic adjustment for wear assures long life under strenuous service. Described in Bulletin 107.

For trouble-free, "worry-proof," efficient pumping at all times — specify Chicago Pumps. Write for complete information.

CHICAGO PUMP COMPANY
Subsidiary of Food Machinery and Chemical Corporation
BUILDING PUMP DIVISION
622 DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

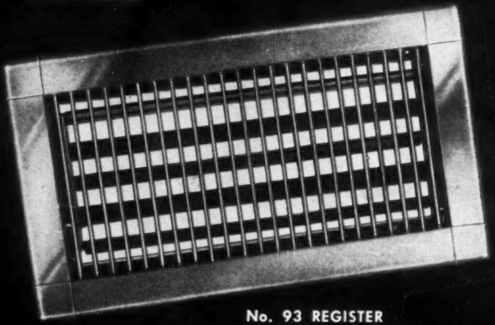
Condo-Vac ®, Sure Return ®, AVC, LVC, Fire, House & Circulating Pumps, Pneumatic & Tankless Water Systems . . Flush Kleen ® Sewage Ejectors, Little Giant ® & Non-Clog Bilge Pumps. Pumps for every Industrial use.

H&C TRIPL-AIRE ®



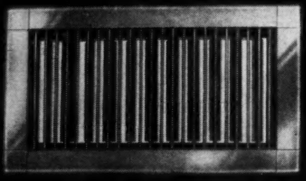
No. 92VHV
MULTI-DEFLECTION REGISTER
vertical face bars, horizontal secondary bars, vertical louvers. Also available without valve — No. 92VHO.

H&C FIXT-AIRE ®

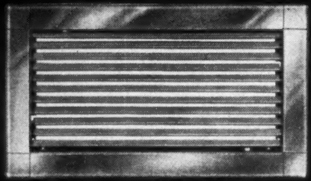


No. 93 REGISTER
Vertical front bars set straight, horizontal louvers.

No. 92VOV — SINGLE DEFLECTION REGISTER with vertical face bars and louvers. Also available without valve — No. 92VOO.



No. 92A GRILLE . . . horizontal face bars set at 22° angle for up or down deflection.



PRODUCTS OF THE WORLD'S LARGEST MANUFACTURERS OF REGISTERS, GRILLES and DIFFUSERS . . .

We have no desire to brag of mere bigness. But we do want you to know that H&C TRIPL-AIRE and FIXT-AIRE registers and grilles, introduced for commercial type installations only about a year ago, were designed, engineered and are constructed by the organization which since the turn of the century has been the leading register manufacturer. Hence you can be sure of getting the best that registers and grilles can contribute to a thoroughly satisfactory air conditioning system by specifying H&C.

There are 26 standard sizes providing 260 possible horizontal and vertical deflection combinations . . . plus a wide range of intermediate sizes. Consequently, there's never a need to compromise . . . the EXACT deflection is always available to you. Other salient features include: Front adjustments for control of face bars and louvers; opposed louvers which permit absolute volume control with equal distribution over the entire face; "Decorator Gray" enamel finish and prompt deliveries.

***CONVENIENT CATALOG GIVES COMPLETE DETAILS AND ENGINEERING DATA.** Available from H&C jobbers or direct from us.*

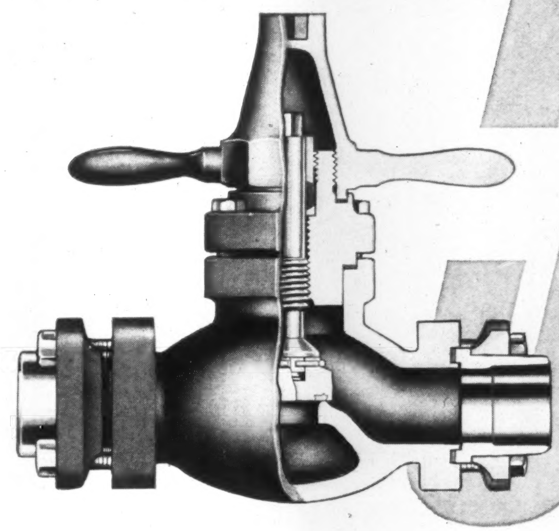
WORLD'S LARGEST PRODUCERS OF REGISTERS and GRILLES

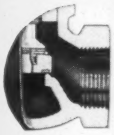
HART & COOLEY MANUFACTURING CO.
2-AC E. EIGHTH ST.
HOLLAND, MICHIGAN

IN CANADA: HART & COOLEY MANUFACTURING CO., FORT ERIE, ONTARIO

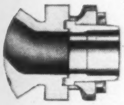
FIVE TYPES OF CONNECTIONS IN HENRY

SEMI-STEEL WING CAP VALVES

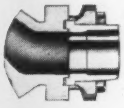




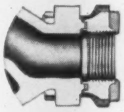
F.P.T.
In Valve Body
½" thru 2½"



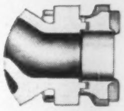
O.D. Solder
Brass Adapter
and Steel Flange
1⅜" thru 5⅛"



Steel Butt Weld Adapter
and Steel Flange
1¼" thru 5"



One Piece F.P.T. Flange
1¼" thru 6"



One Piece Slip-on Weld Flange
1¼" thru 6"

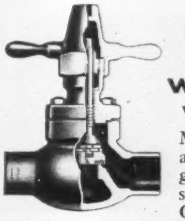
MAKE INSTALLATION EASY

Specify Henry Wing Cap Valves with their wide choice of end connections and your installation costs will always be low.

For example, steel pipe can be screwed directly into the valve body on sizes thru 2½", or it can be screwed into one piece F.P.T. flanges on sizes 1¼" thru 6". It can also be butt welded to separate steel adapters with companion flanges or used with one piece slip-on weld flanges in the same larger size range. If copper pipe is used, separate brass O.D. solder adapters with companion flanges permit soldering or brazing.

BRONZE BODY VALVES all have O.D. solder connections.

Henry offers you other features as well: Full capacity and unrestricted flow—patented self-aligning stem disc that will not rotate—resilient packing—back-seating design which permits repacking under pressure— a gasketed wing cap with socket which, when inverted, can be used to operate valve.



BRONZE ALLOY WING CAP VALVES

Made of bronze alloy to meet government specifications. Compact design —relatively light weight. Bolted bonnet construction and heavy wall bodies for maximum strength and safety. O.D. solder connections machined in valve body. Size range: ⅞" thru 4⅛" globe type; ⅞" thru 3⅛" angle type.

Your favorite wholesaler has a complete line of Henry Wing Cap Valves or can get them for you.

HENRY VALVE CO.
CONTROLLING FLOW
SINCE 1914

HENRY VALVE CO.

MELROSE PARK, ILLINOIS
(Chicago Suburb)
Cable: Hevalco, Melrose Park, Illinois
Valves, Driers, Strainers, Control Devices and Accessories for Refrigeration, Air Conditioning and Industrial Applications.

Modine AIRditioners®

Personalized year-round comfort...

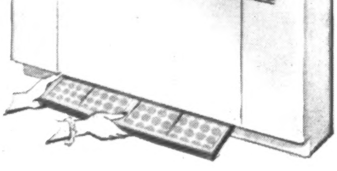
better—at lower annual cost

You get *all* of the inherent benefits of a fan-coil unit air conditioning system with Modine AIRditioners. Compare them on these *five major economy considerations*—and you'll see why beautifully-styled AIRditioners are first choice for both new building and remodeling.

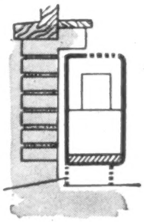
1. Quieter operation. Resiliently suspended Modine fans operate at 1050 rpm top speed. The result—maximum quietness.

2. Lower maintenance costs. AIRditioners have permanently-lubricated motors that never need oiling.

3. Faster installation. AIRditioners are furnished with reversible coils, provision for right- or left-hand piping and wiring, generously sized end sections that do not cramp the installer.



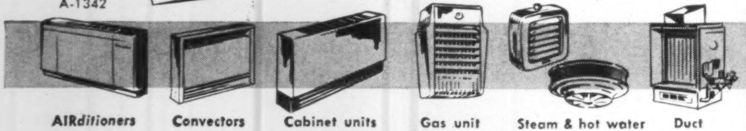
4. Easier filter changing. With AIRditioners you merely tilt the filter rack and *slide* out the filter. No need to loosen or remove the front panel.



5. Easier recessing. Square corners simplify recessing—up to 5 inches, with less than 6 inches protruding into the room.

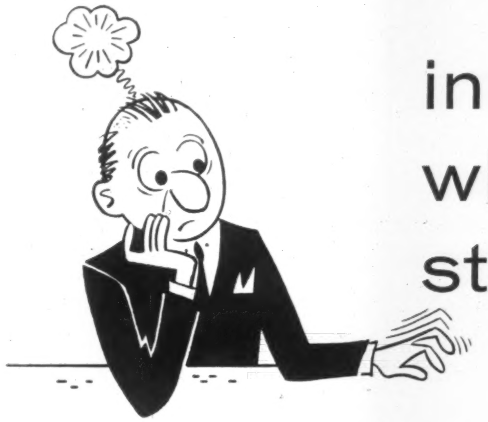
You can choose from console, concealed, overhead or ceiling types in all popular sizes. For facts, see the Modine representative listed in your classified phone book, or write for Bulletin 755 to Modine Mfg. Co., 1509 DeKoven Ave., Racine, Wis.

A-1342



In Canada: Sarco, Ltd., Toronto

Modine
MANUFACTURING COMPANY



in a quandary about where to get stainless steel pipe?

CALL YOUR REPUBLIC ELECTRUNITE DISTRIBUTOR

He can clear up any doubts by solving your problems immediately. He has the sizes you need in the analyses the job calls for. Just name the requirements and he'll ship promptly.

He can furnish Republic ELECTRUNITE® Stainless Steel Pipe in types 304, 304-L, 316, 316-L, 321 and 347—plus other analyses. Continuous welded sizes from ⅛″ I.P.S. through 2″ I.P.S. in A.S.A. schedule 40S; from ⅛″ I.P.S. through 4″ I.P.S. in schedule 10S; and from ½″ I.P.S. through 4″ I.P.S. in schedule 5S wall thicknesses. Larger sizes up to 30″ also available. And you can get Republic Stainless Steel Tubing in a complete range of sizes and analyses.

For quick and positive identification, "Republic ELECTRUNITE" is clearly stenciled the full length, with the type, heat number and specification. It is always easy to identify no matter where it's cut. And joining Republic ELECTRUNITE is no problem. You have a choice of welding, threading or using compression fittings.

Give your Republic ELECTRUNITE Distributor a chance to show what he can do. He deals only in quality stainless steel pipe and tubing—and he's eager to serve you. Send coupon for more information.

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KENTUCKY
McJunkin Corp., Louisville
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OHIO
McJunkin Corp., Columbus
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The Baldwin Co., Houston

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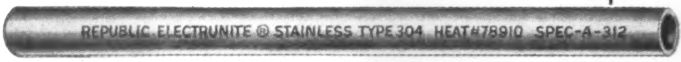
REPUBLIC ELECTRUNITE ® STAINLESS TYPE 304 HEAT#78910 SPEC-A-312

REPUBLIC STEEL

World's Widest Range
of Standard Steels and Steel Products

REPUBLIC STEEL

REPUBLIC STEEL CORPORATION
Steel and Tubes Division
228 East 131st Street, Cleveland 8, Ohio

Please send me information on Stainless Steel Pipe and Tubing.

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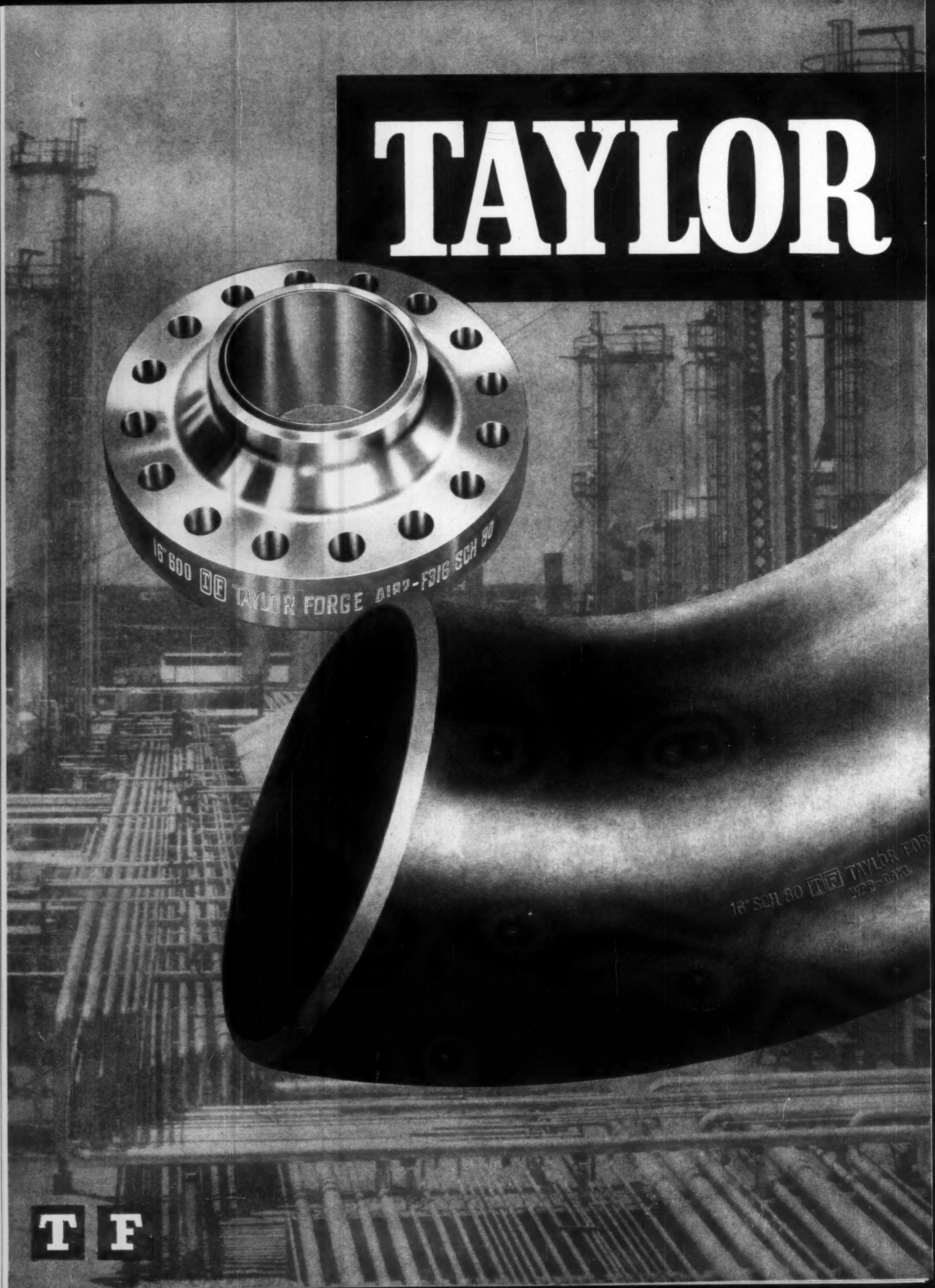
TAYLOR
16" 600 TF TAYLOR FORGE A182-F316 SCH 80
16" SCH 80 TF TAYLOR FORG
WPB-OAKL
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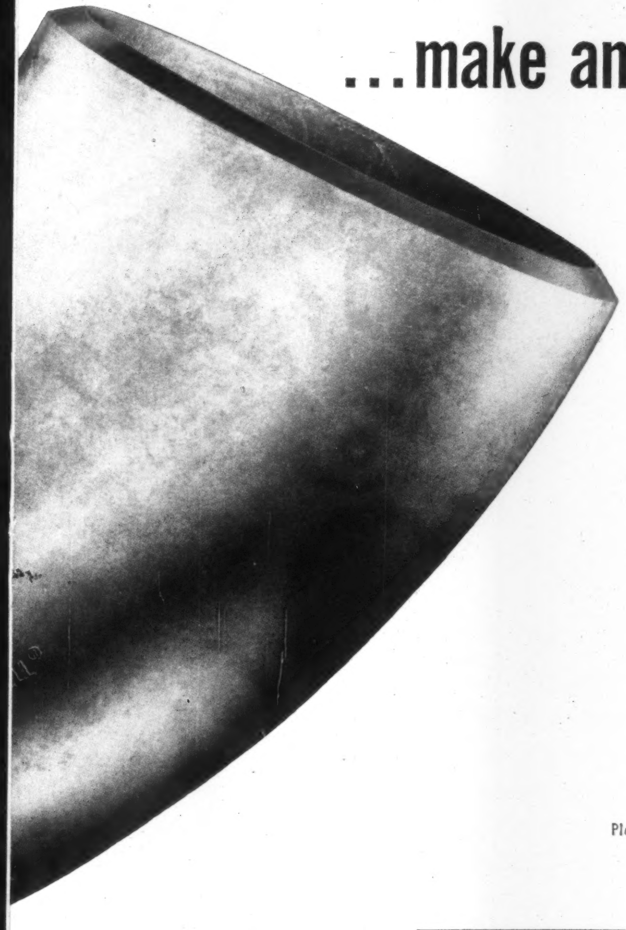
FORGE Welding Fittings and Forged Flanges

...make any good piping job *better*!



Quality in welding fittings and forged flanges is many things. It is engineering exactitude and manufacturing integrity translated into flawless metal expertly formed, forged, shaped. It's that hard-to-define ingredient which assures dependability . . . always . . . under all conditions. It is something that only experience can produce. And it is the combination of these elements that makes quality conscious buyers

turn to Taylor Forge . . .

TRADITIONALLY DEPENDABLE

Taylor Forge and Pipe Works

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Plants at: Carnegie, Pa., Gary, Ind., Houston, Texas, Fontana, Calif., Hamilton, Ont., Canada
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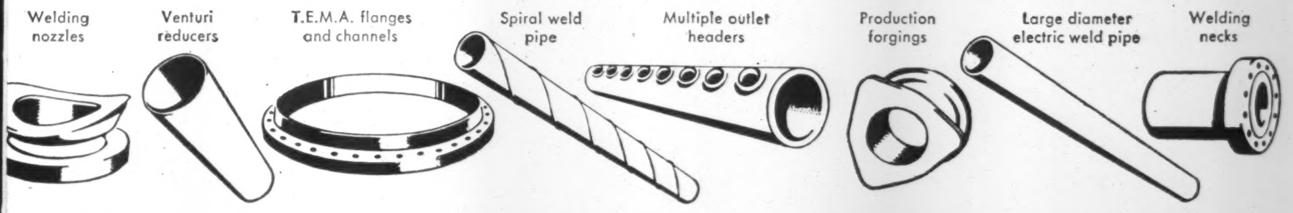
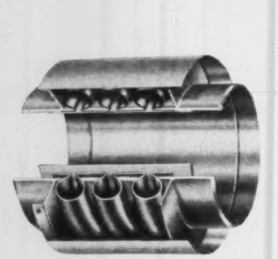
For Prompt Service . . . See Your Nearby Taylor Forge Distributor

He carries a full stock of Taylor Forge Welding Fittings and Forged Flanges. And he is as near as your telephone. His organization is efficient and reliable and through him you have available the services of Taylor Forge engineers for advice and counsel on any piping problems.


Welding nozzles
Venturi reducers
T.E.M.A. flanges and channels
Spiral weld pipe
Multiple outlet headers
Production forgings
Large diameter electric weld pipe
Welding necks

NEW ZALLEA HyPTor* TOROIDAL EXPANSION JOINT



HyPTor corrugations have a circular or toroidal cross section which provides a lower operating stress at any given pressure than any other corrugation shape.

For unequalled endurance at pressure and temperature extremes

This unique toroidal expansion joint with thin-walled bellows is setting new performance and durability records in high pressure, high temperature service. It was developed to meet the severest operating conditions without sacrificing long life.

Minimum stress at high pressures is one advantage of the Zallea HyPTor. This is due to the thin-walled bellows and toroidal corrugations. Thin walls develop lowest flexing stress. The toroidal cross section assures lower operating stress at any pressure.

Superior performance at high temperatures. The toroidal corrugation of the HyPTor makes it suitable for use at high temperatures. Also, the HyPTor is hydraulically formed and free from circumferential welds which would act as stress raisers.

Longer life on the job. The ability of the HyPTor to absorb punishment without ill effects has been proved in service. A number of HyPTor Expansion Joints designed for 700 psi working pressure, were installed in liquid oxygen service in 1948. They are still operating . . . at pressures up to 2300 psi.

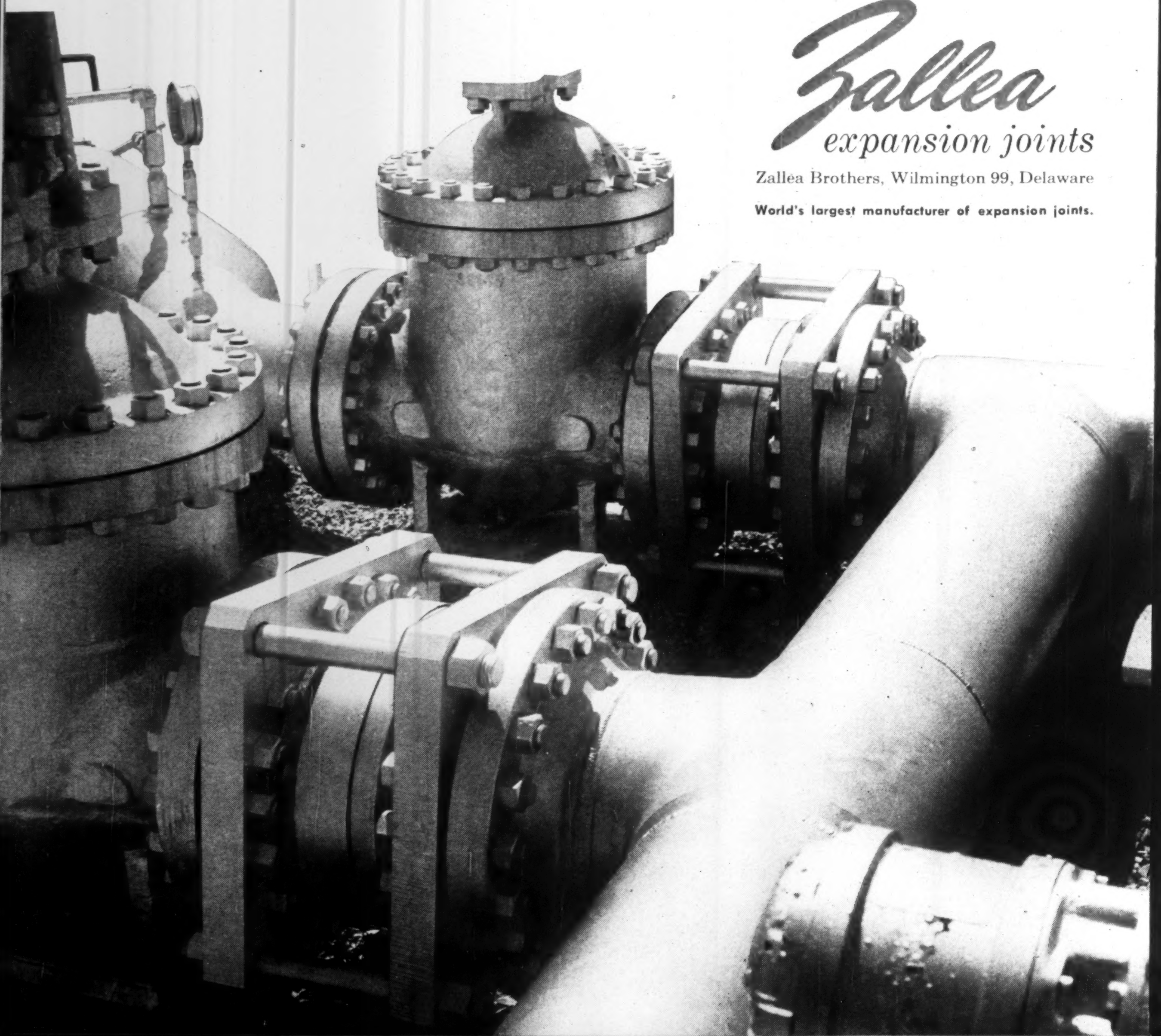
Get the complete story of the new Zallea HyPTor Expansion Joints. Our new 72-page Expansion Joint Manual gives full details—plus worthwhile information on basic types, design and installation data, expansion joint selection and recommended specifications. Write on your Company letterhead, for your free copy of Catalog 56, Zallea Brothers, 816 Locust Street, Wilmington 99, Delaware.

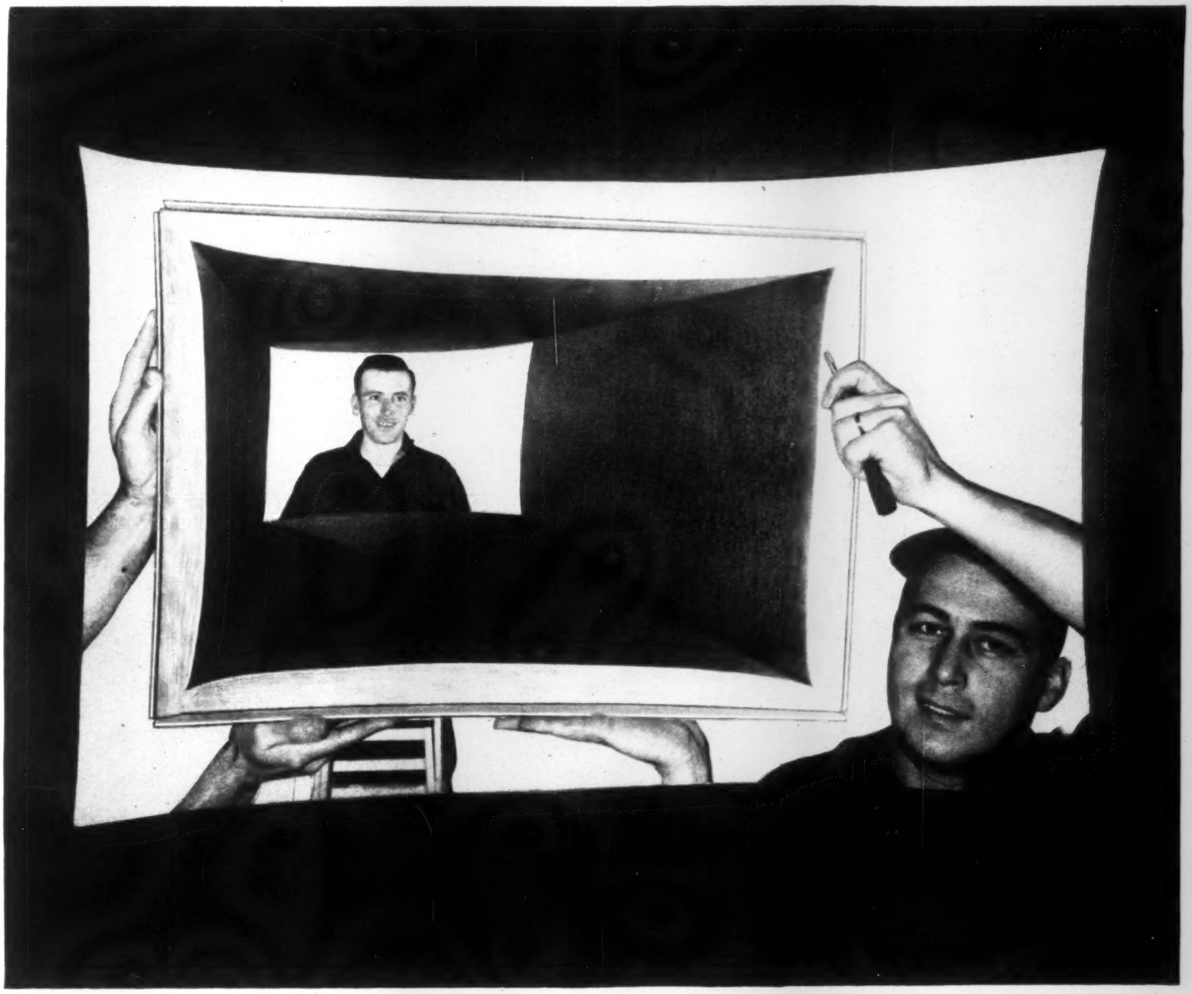
*Patented

Zallea
expansion joints

Zallea Brothers, Wilmington 99, Delaware

World's largest manufacturer of expansion joints.





Ducts lined with L·O·F Glass Fibers' Microtex are easy to fabricate and install; offer maximum insulation per dollar.

L·O·F Glass Fibers' Microtex duct liner gives 3-way protection, even at peak air velocities

For more efficient, 3-way insulation . . . under *all* operating conditions . . . at low cost, specify L·O·F Glass Fibers' Microtex duct liner. Fine glass fibers absorb mechanical noises; insulate warm- and cold-air ducts against heat transfer. Duct itself acts as a vapor barrier. Sprayed facing resists air erosion, even at top operating velocities.

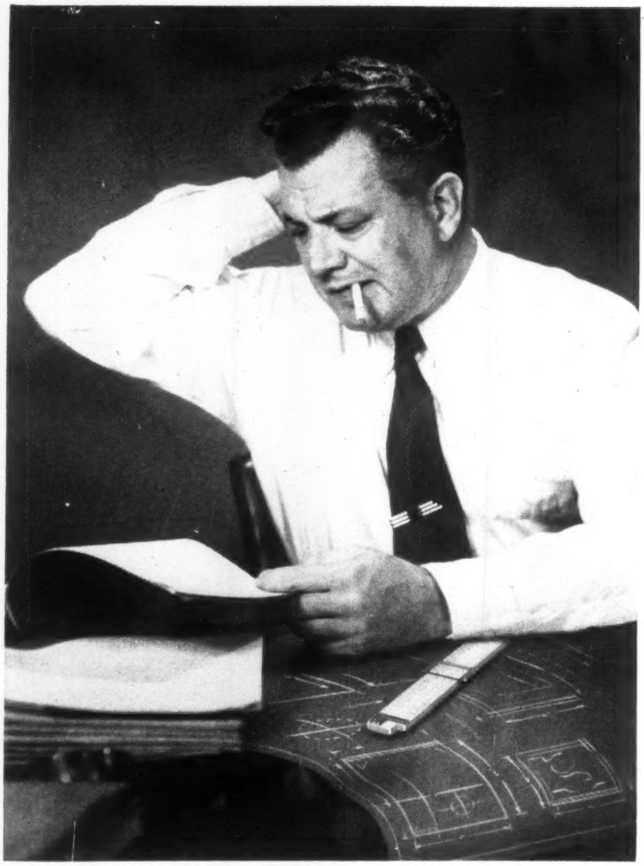
Economical Microtex provides maximum insulation per dollar. Applied quickly with adhesive and formed with the duct in the brake, Microtex requires no special skills, tools or equipment. Can be easily cut and fitted into irregular sections. Available in 1½, 2, and 3 lb./cu. ft. densities, coated with black vinyl, Microtex is:

- strong
- permanent
- lightweight
- fire-resistant
- resilient
- pleasant to handle

Get the facts on high-efficiency, low-cost Microtex duct liner. Contact our distributor, or write: *L·O·F Glass Fibers Company, Dept. 39-47, 1810 Madison Avenue, Toledo 1, Ohio.*

L·O·F GLASS FIBERS

L·O·F GLASS FIBERS COMPANY • TOLEDO 1, OHIO



Have you tried PLASTIC pipe?

There are many plumbing and air-conditioning applications where you can reduce costs in time and material by using USS NATIONAL Polyethylene Plastic Pipe.*

YOU'LL SAVE TIME since it's so quick and easy to install. The long, continuous lengths of flexible polyethylene pipe require few joints, and those used are of the insert type, quickly secured with stainless steel clamps.

YOU'LL SAVE WORK since NATIONAL Plastic Pipe is so lightweight a 200-foot coil of 2-inch diameter can be carried on your shoulder.

YOU'LL SAVE MATERIALS since NATIONAL Plastic Pipe doesn't crack or break from rough handling, even at very low temperatures. And it retains its toughness and flexibility over its entire working range from minus 90°F. to plus 120°F.

YOU'LL ELIMINATE CORROSION. NATIONAL Plastic Pipe resists attack by acids, alkalis, alcohols, salts and other chemicals. Its smooth interior offers little flow resistance, thus preventing clogging and scaling.

ALL USS NATIONAL Plastic Pipe is manufactured from 100% virgin "on grade" polyethylene raw material. It imparts no taste or odor to the liquids passing through it.

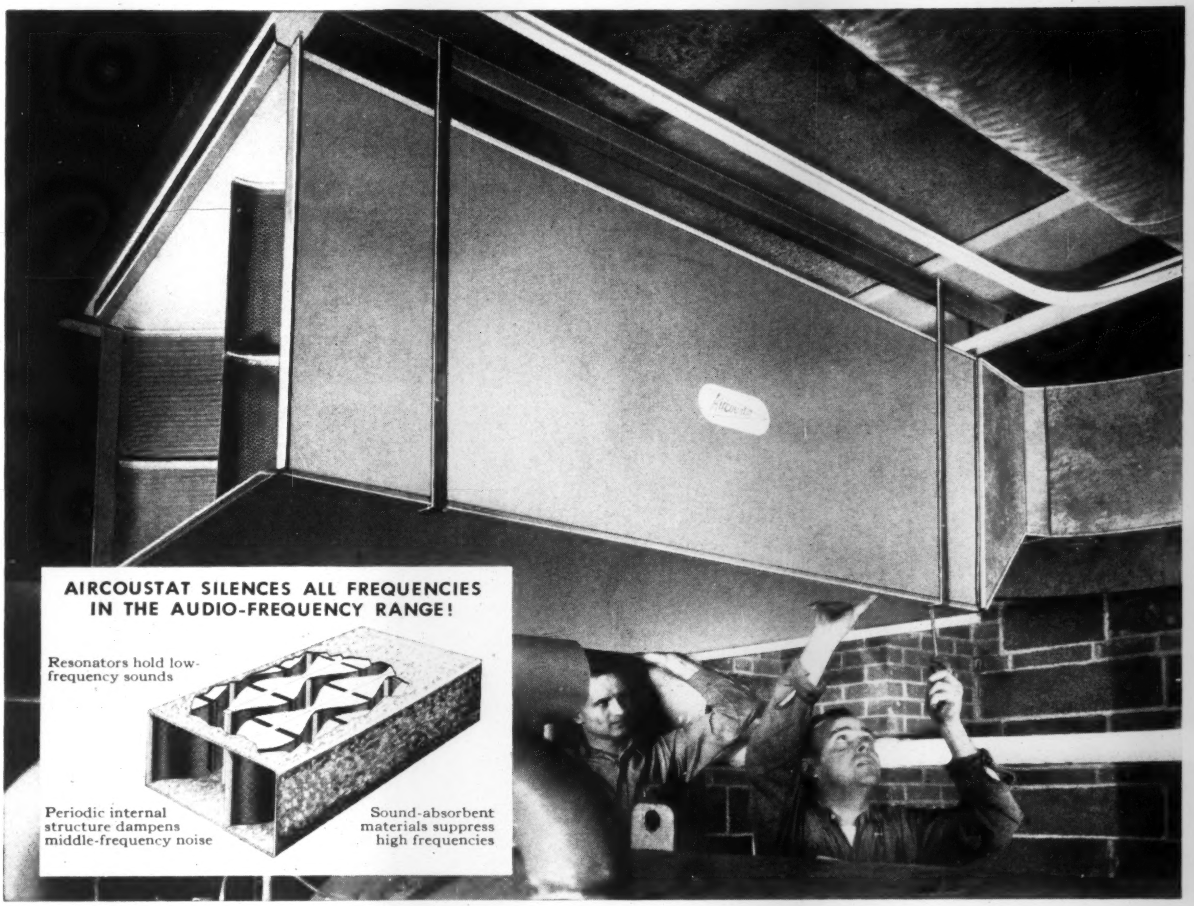
USS NATIONAL POLYETHYLENE PLASTIC PIPE *is available in sizes from ½ inch to 6 inches in diameter, in a variety of wall thicknesses. For further information, write to National Tube Division, United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa. Ask for Bulletin No. 29.*

**Trademark*

NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS NATIONAL *plastic* PIPE

UNITED STATES STEEL


AIRCOUSTAT SILENCES ALL FREQUENCIES IN THE AUDIO-FREQUENCY RANGE!
Resonators hold low-frequency sounds
Periodic internal structure dampens middle-frequency noise
Sound-absorbent materials suppress high frequencies

AIRCOUSTAT* Sound Traps eliminate air conditioning noise at 50% less cost

Acoustical Performance Guaranteed. Easy to Install. Pre-Engineered — No Design or Layout Headaches.

Revolutionary AIRCOUSTAT Sound Traps require no special tools for installation . . . reduce your labor costs and lower your installation time. Units fit any size or shape of duct. If AIRCOUSTAT fits *geometrically,* it fits *acoustically*.

AIRCOUSTAT is the most efficient method of sound-deadening you can provide your customers. A 7-foot AIRCOUSTAT unit suppresses as much sound as 100 feet of ordinary duct lining. AIRCOUSTAT eliminates all frequencies in the entire audio-frequency range, silences entire systems or selected outlets. Flow resistance and pressure drop are lower. 4 series cover applications ranging from general offices to recording studios.

Discover how AIRCOUSTAT Sound Traps can save you time and money . . . create greater customer satisfaction.

*Koppers Trade Mark

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INDUSTRIAL SOUND CONTROL

Engineered Products Sold with Service

MAIL THIS COUPON TODAY

KOPPERS COMPANY, INC., Metal Products Div., Industrial Sound Control Dept., 6204 Scott St., Baltimore 3, Md.

Gentlemen: Please send me a free copy of your booklet on AIRCOUSTAT Sound Traps.

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Company...

Address...

City............................ Zone...... State.............

lowest capital outlay for complete hot underground pipe protection

TRI-SUL-ITE

3-WAY PROTECTION SYSTEM

Yes, a *single, adhering* material, TRI-SUL-ITE, provides complete 3-way protection for hot underground pipes.

TRI-SUL-ITE is a specially selected, high quality Gilsonite. You pour and work it around and under the pipes, then lightly tamp. Simple curing by proper pipe heat converts TRI-SUL-ITE into an efficient 3-zone protective barrier against water, corrosion and heat loss.

ZONE 1, adjacent to and adhering to the pipe, consists of completely fused TRI-SUL-ITE. This zone is a permanent water barrier. It prevents water from following the grade of the pipe.

ZONE 2 consists of partially fused TRI-SUL-ITE granules—an efficient insulator.

ZONE 3 consists of unfused TRI-SUL-ITE granules. This zone resists water penetration, and is an excellent insulator. It also cushions shocks and stresses.

TRI-SUL-ITE is readily adaptable to future pipe changes. Old material can be quickly removed and new material installed as simply as before, without jeopardizing the original installation.

Write for literature to Dept. H

G. S. ZIEGLER & COMPANY

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GREAT NECK, N. Y.

MINES: "CASTLE PEAK," "LITTLE BONANZA," "LITTLE EMMA" • PROCESSING PLANTS: CRAIG, COLO., PROVO, UTAH

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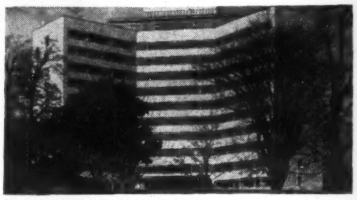

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Elhatton Plumbing & Heating Co.—Plumbing Contractor
W. B. Parsons Co.—RECO Representative, Needham, Mass.

On Call Around the Clock . . . Hot Water by RECO!

RHODE ISLAND HOSPITAL's new 452 bed Main Building relies on RECO Hot Water Storage Heaters for plenty of hospital-pure hot water. Made of tough, rust-proof copper silicon, these RECO storage heaters were ASME built and tested to *deliver over 10,000 gallons of 180° hot water* per hour, every hour. And RECO guarantees this performance.

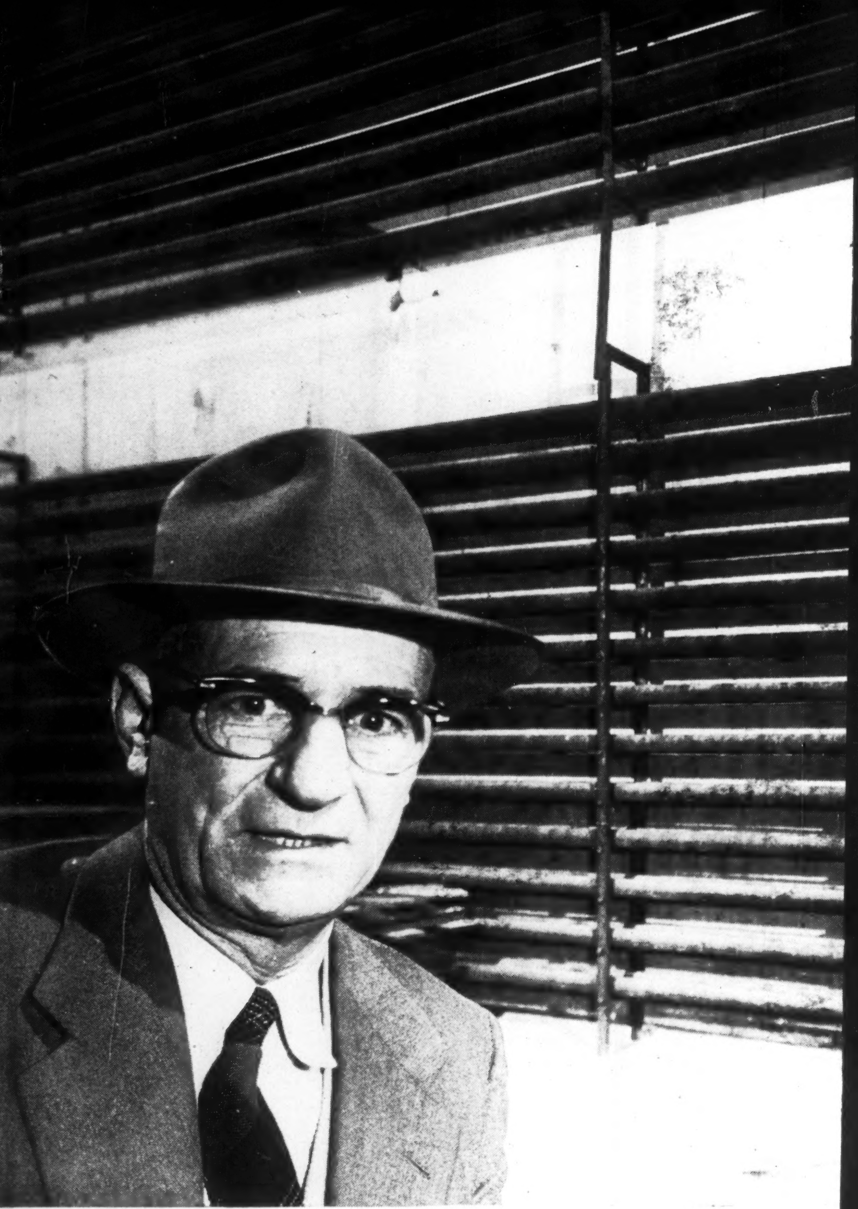
Make the RECO guarantee of top quality, fair price and quick delivery a part of your next heating job. SPECIFY RECO.

Write today for free catalogs, plus name of RECO representative nearest you to: Dept. L, Richmond Engineering Co., Inc., 7th & Hospital Sts., Richmond, Va.

RICHMOND ENGINEERING CO., INC.

Grapes are stored at 32°F, potatoes at 40°F. Anhydrous ammonia, carried in SPANG CW Steel Pipe, is used as the refrigerant.

Mr. George Eckert, standing in one of the storage cooler rooms, reports on performance of SPANG CW Steel Pipe at Bakersfield Ice & Cold Storage Company. Despite acid action and earthquake vibrations, no replacements have been necessary in almost 15 years service.



"ACID ACTION HAS FAILED TO MAR THE PERFORMANCE OF SPANG CW STEEL PIPE IN OVER 14 YEARS SERVICE"

says Mr. George C. Eckert,
Vice President and Manager,
Bakersfield Ice & Cold Storage
Company, Bakersfield, Calif.

"Repeated coatings with sulphuric acid film, occasional earthquake vibrations, and a constant flow of anhydrous ammonia have all failed to damage our Spang CW Steel Pipe, installed in 1942. In fact, no piping replacements have been necessary during the almost 15 years of continuous operation to which the pipe has been subjected," reports Mr. Eckert.

"Last year we stored 85 carloads of grapes. The control of bacteria and insect life on grapes requires the weekly use of sulphur dioxide gas which is sprayed into the storage room. The gas changes into sulphuric acid when it strikes moisture, forming a highly corrosive film on the pipe surface. This acid action, however, has failed to mar the performance of the Spang CW Steel Pipe which has endured this condition for more than 14 years, and is still giving good service," commented Mr. Eckert.

THAT'S SPANG QUALITY CONTROL AT WORK!

Quality Control in manufacturing builds long years of service into every foot of Spang CW Steel Pipe. Careful attention to temperatures and forming and welding pressures produces in Spang that extra *quality* that means extra service for you.

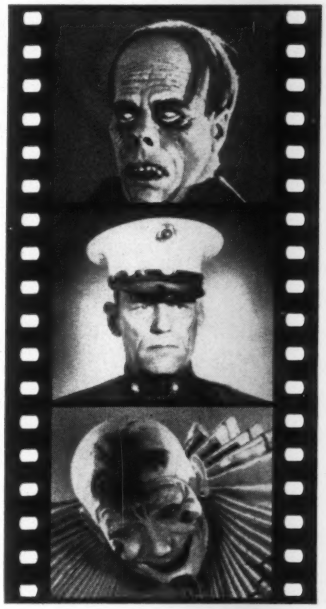
Prove to yourself what Spang Steel Pipe can do for you. Make your next pipe order Spang CW Steel Pipe. Your nearby Spang distributor will be glad to serve you.

SPANG
CW
STEEL PIPE
SPANG CW

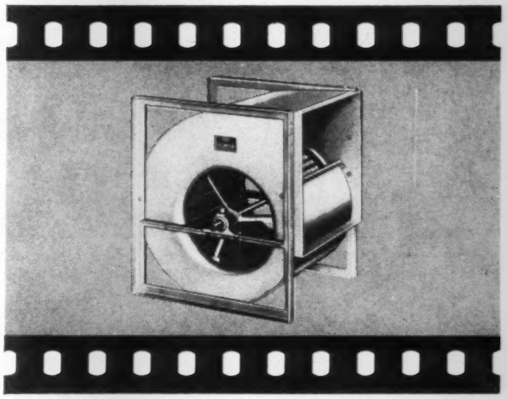
SPANG-CHALFANT

Division of The National Supply Company
General Sales Offices: Two Gateway Center, Pittsburgh, Pa. District Sales Offices: Atlanta, Boston, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis

MAN OF MANY ROLES



FAN OF MANY ROLES



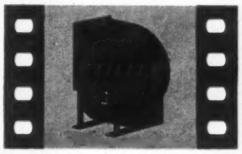
Remember Lon Chaney? He gave chills galore to silent film fans in "Phantom of the Opera"... moved from role to difficult role at the drop of an opera cloak, earning him his stage name, "Man of A Thousand Faces."

At Utility, we have a blower as nimble as Mr. Chaney at changing roles—at your "direction." Known off location as the 4-Way Discharge Blower, **on** location it positions quickly in any one of four positions—top horizontal, top vertical, bottom horizontal or bottom vertical. If we wanted to stretch a point, there are actually **eight** positions, since the fan faces left or right at any of the above angles.

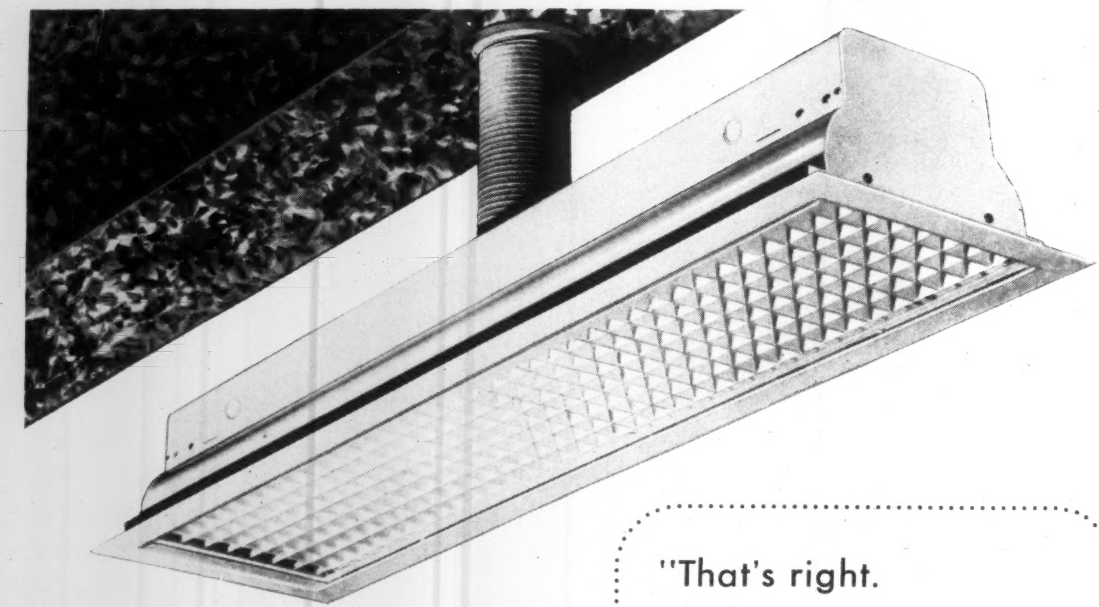
The key to the stellar performance of Utility's 4-Way Discharge Blower is the rigid frame. You simply place the fan in the desired discharge position and the job is done, without bolts or screws or costly sheet metal work. This rigid frame also adds a bonus of strength and stability to the installation. Inventory-wise it makes sense. Available in single and double widths, this blower can take care of many jobs without emergency re-ordering or "hand fashioning" on the job.

The quality is there—and it's all Utility! One-piece wheel for rigidity, long life and super-quiet operation. And due to Utility's advanced production techniques, this "fan of many roles" is priced with the lowest. Proving again that when quality and price must get together, Utility is always the logical answer.

A Division of Utility Appliance Corp.
UTILITY FAN CORP
911 East 59th Street, Los Angeles 1, California



Manufacturers of heavy
and standard duty blowers for
heating, air conditioning
and ventilating installations.
Producers of blowers
and blower parts for original
equipment manufacturers.
Write for catalogue data.



"That's right.
It's the new
Multi-vent Troffer
The air diffuser
is completely concealed
in the flush light fixture!"

"You mean you get
both air *and* light
from the same unit?"

There's more to the new **Multi-vent Troffer** than meets the eye!

It combines a great advance in gently diffused, draft-free air conditioning, with modern, highly efficient lighting at a substantial savings in cost!

Complete concealment of the air diffuser within the handsome light fixture means freedom for the architect to design clean, uncluttered ceilings, greatly simplified mechanical planning for the engineer and . . . for the contractor . . . faster, easier field installation.

Write for detailed literature and the name of the representative in your area.

multi-vent
DIVISION OF
THE PYLE-NATIONAL COMPANY

1373 N. Kostner Avenue, Chicago 51, Illinois

WHERE QUALITY IS TRADITIONAL

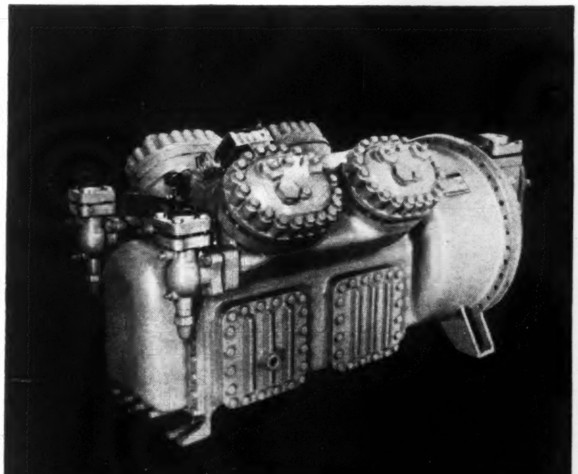
Multi-Vent® by The Pyle-National Company—Trofferlite by Benjamin Electric Mfg. Co.

SALES AND ENGINEERING REPRESENTATIVES IN PRINCIPAL CITIES OF THE UNITED STATES AND CANADA

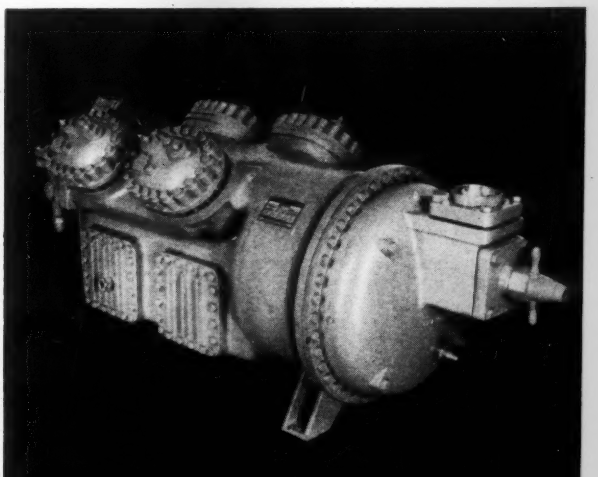
Exclusive . . . from **WESTINGHOUSE!**

Full Range of Hermetic Compressors

with 2 to 120 ton ratings



The New CLS 315 8 cylinders—90 tons



The New CLS 420 8 cylinders—120 tons

2 New Westinghouse Hermetic Types Give Larger Capacity in Smaller Size

Again Westinghouse leads in compressor manufacture. We introduced the first hermetics in 1937 . . . now—20 years later—this dependable compressor is the standard of the industry. And the full range of 14 hermetic types now includes compressors of 2, 3, 5, 7½, 10, 15, 20, 25, 30, 40, 50, 60, 90 and 120 ton ratings!

These two newest Westinghouse compressors are more compact, smoother operating, lighter, and easier to install. They give greatest performance in smallest space. They give more capacity per dollar. These are some of the many reasons you save on costs, installation labor, freight, and space with Westinghouse Air Conditioning Compressors and Accessories.

Hermetic Compressors by Westinghouse have been successfully proved in thousands of successful applications around the world. Their hermetic design permanently seals out dirt and moisture. Belts, pulleys and shaft seals are eliminated. They operate quietly. Requiring no ventilation, they may be installed where other types would be unsuitable.

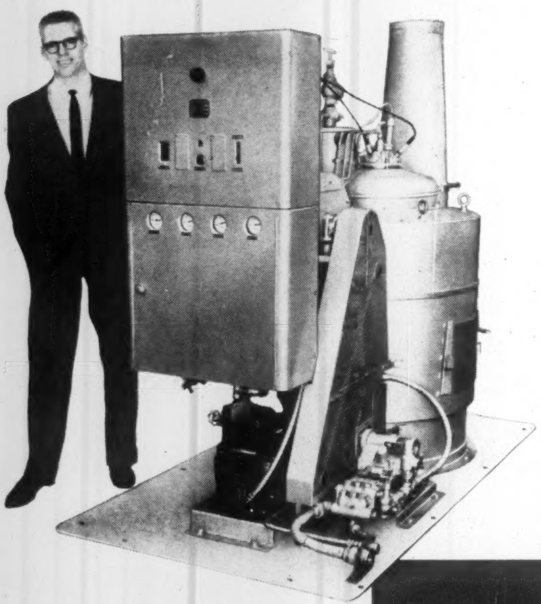
Like all Westinghouse hermetic compressors, Type CLS 315 and CLS 420 are completely automatic in operation. A complete line of matching accessories and condensers is also available.

Get the full news and complete specifications from your Westinghouse Air Conditioning Office. You'll find it in the Yellow Pages!

YOU CAN BE SURE... IF IT'S Westinghouse

J-80531-A

WESTINGHOUSE ELECTRIC CORPORATION • AIR CONDITIONING DIVISION • STAUNTON, VA.



don't use floor space for your boiler room

VAPOR MODULĀTIC

WATER TUBE BOILER

you can put it on the roof—
on a balcony—or hang it
from the ceiling

PAY FOR YOUR STEAM
THRU FLOOR SPACE SAVED!

OVER 13,000
SATISFIED USERS

produces up to 4 h.p. per sq. ft. of area

- Develops up to 27 H.P. per 1000# of weight.
- Produces up to .6 H.P. per *cubic ft.* of space used.
- Needs only 15″ above top of boiler for maintenance. No additional floor space needed.
- Can produce 10% or more above ratings, continuously.
- Full ASME approved.
- It is a complete package unit.
- Proved by 25 years in America's toughest boiler rooms.

Write for complete specifications on the boiler that requires less space and permits lighter floor structure—The Vapor Modulatic.

VAPOR HEATING CORPORATION, 80 E. Jackson Blvd., Chicago 4
Dept. 21-D

Send me Modulatic Bulletin No. 586.

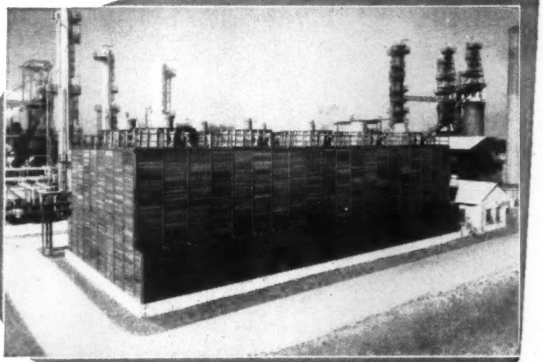
Name____________________ Title__________
Company____________________
Address____________________
City____________ Zone_____ State________

PRITCHARD CAN SOLVE YOUR COOLING TOWER PROBLEMS

WITH

Pritchard

HEAVY-DUTY COOLING TOWERS

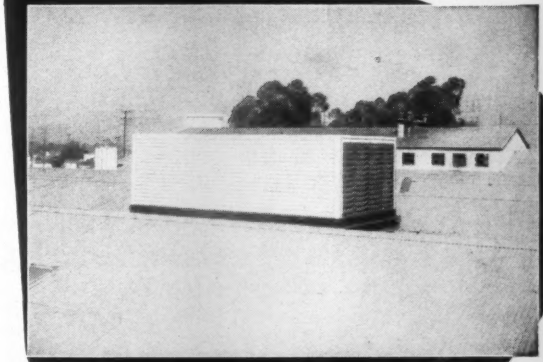


(COUNTERFLOW) ↕

WITH

Pritchard

LoLine® COOLING TOWERS



(CROSSFLOW)

What are Pritchard's qualifications for assisting you in selecting the cooling tower best for your specific needs? They are twofold:

1. Pritchard—a founder member of The Cooling Tower Institute—has years of experience in the field of cooling tower application to draw upon—experience in many and varied industries and processes.
2. Pritchard manufactures *both* heavy-duty, counterflow industrial cooling towers and the smaller LoLine crossflow tower for air conditioning or industrial service.

Whichever your need, you can be sure of one thing—you get more from Pritchard! For example, the economical water cooling provided by the Pritchard LoLine; the exclusive, patented POWairSAVER fan on industrial models. If you want guaranteed performance... more for your cooling tower dollar... consult your nearest Pritchard representative (you'll find him listed in the classified section of your phone book). Or if you prefer, write direct to Pritchard for more information.

SEND FOR TWO FREE BROCHURES

It costs you nothing to get the whole story on Pritchard cooling towers. Just a note to us on your company letterhead is all it takes to get your free copies of the new, LoLine Brochure (gives you all the details and data on Pritchard's low silhouette, crossflow towers) and "The Answers to 15 Questions About Pritchard Industrial Towers" (the inside story of Pritchard Counterflow towers). You are under no obligation, of course, so write today!

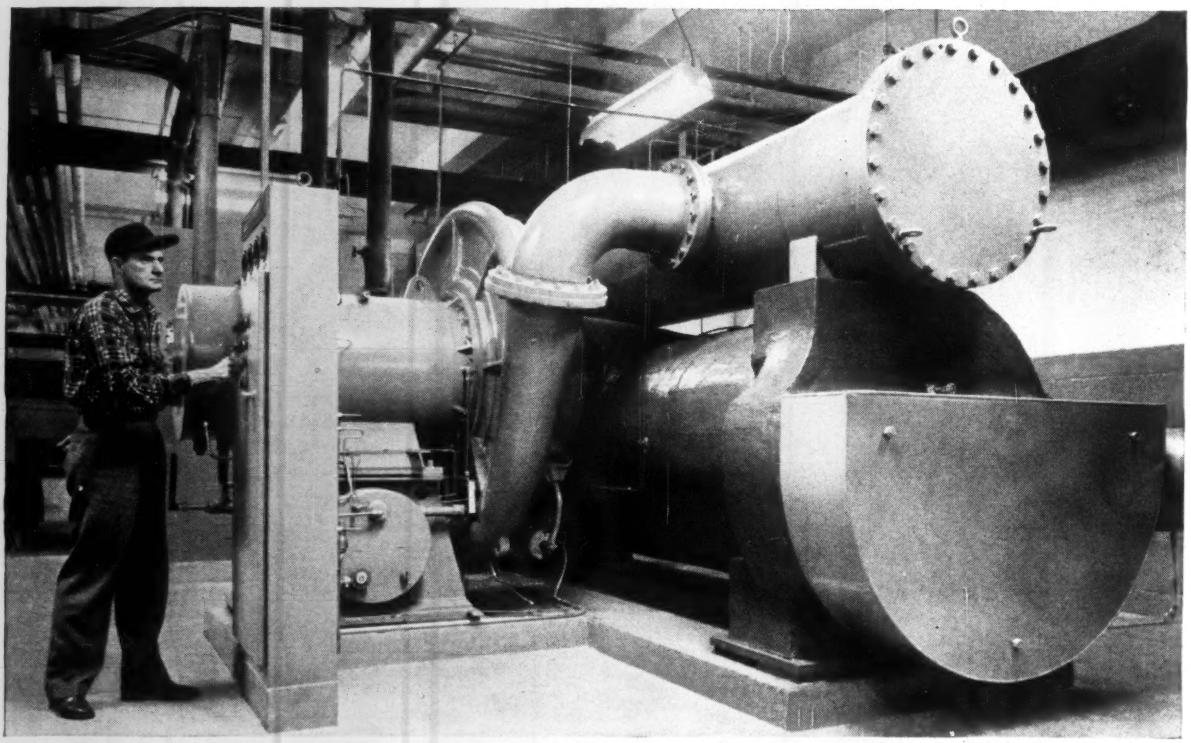
INDUSTRY'S PARTNER FOR PROGRESS

COOLING TOWERS
GAS & AIR TREATING EQUIPMENT

REPRESENTATIVES
IN PRINCIPAL CITIES
FROM COAST
TO COAST

J.F. **Pritchard** & Co.
OF CALIFORNIA
A DIVISION OF J. F. PRITCHARD & CO
Dept. 587 4625 Roanoke Parkway, Kansas City 12, Mo.

AMERICAN BLOWER AIR CONDITIONING



New Orleans Federal Office Building's Tonracs maintain constant chilled-water temperature—regardless of load.

Tonrac provides air-conditioning load variations from 0 to 100% in New Orleans Federal Building

Teamwork like this brought effective air conditioning to the Federal Office Building, New Orleans. L. to r.: I. A. Lindberg, American Blower; G. M. Graf, group supvr., General Services Administration; E. A. Stack, chief engineer, Federal Building; G. A. Hero III and A. A. Hero, Comfortair Co.

To provide controlled indoor comfort, the U.S. Government installed air conditioning in their New Orleans Federal Office Building.

For the heart of the system, they chose two 300-ton American Blower TONRAC® centrifugal refrigeration machines. Here's why, in the words of Alvin Hero, president, Comfortair Company, Inc., New Orleans air-conditioning contractors:

"After inspecting available units, Tonracs were selected because they were found to be most flexible, easy to install; and they met and exceeded government requirements.

"In this installation, humidity control was the primary factor. Not only was it necessary for the Tonracs to operate at full capacity, but the lower variable—below 10% of capacity—was equally important to keep humidity low at night and during week ends."

If your client's building or remodeling plans include air conditioning, why not call in an American Blower representative at the *planning* stage? American Blower Division of American-Standard, Detroit 32, Michigan. In Canada: Canadian Sirocco products, Windsor, Ontario.

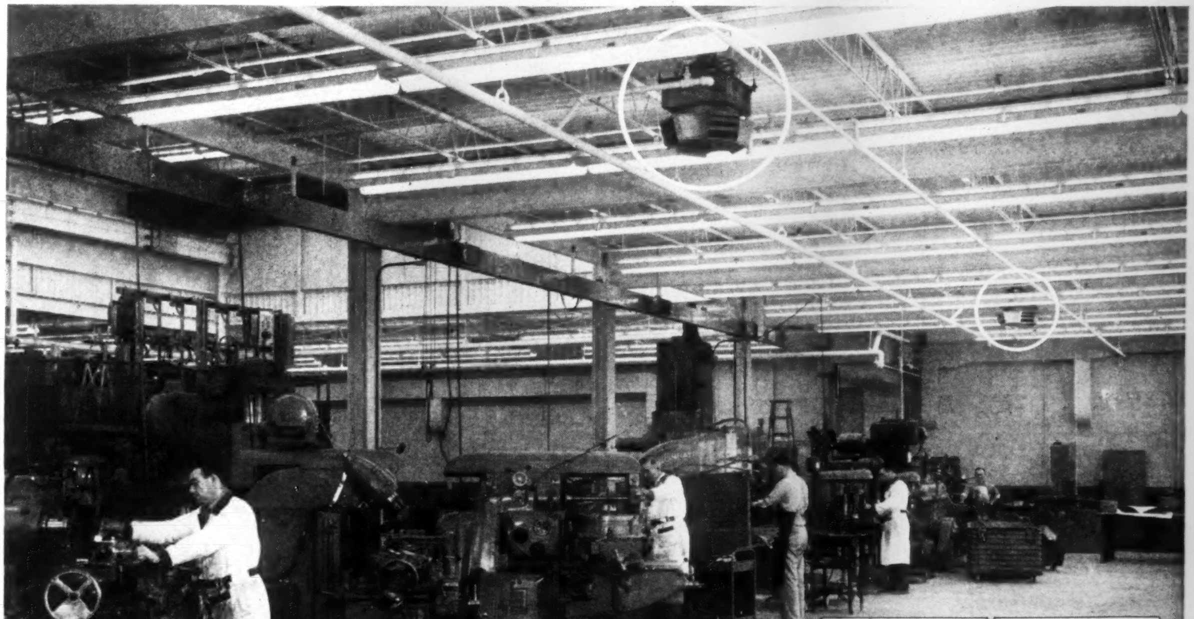
AMERICAN BLOWER

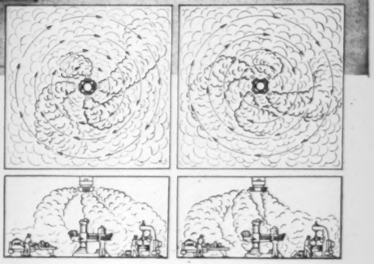
Division of **AMERICAN-Standard**

American-Standard Products

Air conditioning equipment for every business

"*Revolving Heat*" means Comfort *plus* Efficiency





The above photograph shows a section of a new plant of Kirkhof Electric Mfg. Co., Grand Rapids, Mich.

No disturbing Hot Blast on Men, Machines or Materials

Because the heat distributor of "Wing Revolving" Heaters keeps turning slowly, the direction of distribution of the warm air is progressively changing through 360 degrees. As a result, warm air is swept gently outward over wide areas and around obstructions. Greatest possible coverage is assured. Deflectors on distributors are so adjusted that each directs its airstream on a different diameter circle. This can be seen in the diagrams at right.

Workers In Fixed Positions Are Never Subjected To Annoying and Enervating Steady Hot Blasts. In the manufacture of products to close tolerances where uniform temperatures are essential, neither machines nor materials are ever adversely affected.

"Wing Revolving" Heaters Have Year Around Usefulness. In summer, with heaters operating with steam turned off, the revolving distributors produce a pleasant, cooling effect that keeps workers comfortable and more productive.

Details of "Wing Revolving" Heaters are contained in Bulletin HR-6A.

Wing

REVOLVING HEATERS

L. J. Wing Mfg. Co.

140 Vreeland Mills Road, Linden, N. J.
Factories: Linden, N. J. and Montreal, Can.
In Europe: WANSON, Haren Nord, Brussels, Belgium

WING FRESH AIR SUPPLY HEATERS

WING FANS

WING DRAFT INDUCERS

WING BLOWERS

WING TURBINES

HP-4

J. Wing Mfg. Co.
140 Vreeland Mills Rd., Linden, N. J.
Please send me Bulletin HR-6A—Revolving Heaters

Name ....
Firm ....
Address ....
City .... Zone ...... State ....

Over 150 tons of G-E Zone-by-Zone Air Conditioning serve the entire Louise Obici Memorial Hospital in Suffolk, Va. In all, 26 General Electric Packaged Units were installed with no major alteration or structural changes.

Linen closets house and conceal compact General Electric Air Conditioners providing service to another area.

Basement storeroom also houses General Electric Units. These four units serve a section of first floor wing.

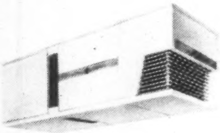
Installation by
Mechanical Engineering Corp., Norfolk, Va.

GENERAL ELECTRIC ZONE-BY-ZONE AIR CONDITIONING

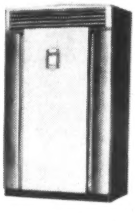
Selected as most practical method for modern hospital

Nobody would ever guess that General Electric Air Conditioning was installed *after* this hospital was completed—so well concealed are the quiet General Electric Units.

Zone-by-Zone Air Conditioning is also a sure way to solve budgeting problems. It is easy to install—no costly interruptions—no major alterations—no heavy initial outlay. Operation is economical and space problem is minimized. Indeed, more and more architects are specifying General Electric Zone-by-Zone Air Conditioning as the most practical answer for every requirement. General Electric Company, Commercial and Industrial Air Conditioning Dept., 5 Lawrence St., Bloomfield, N. J.



Ceiling-mounted units use no floor space—air-cooled and water-cooled.

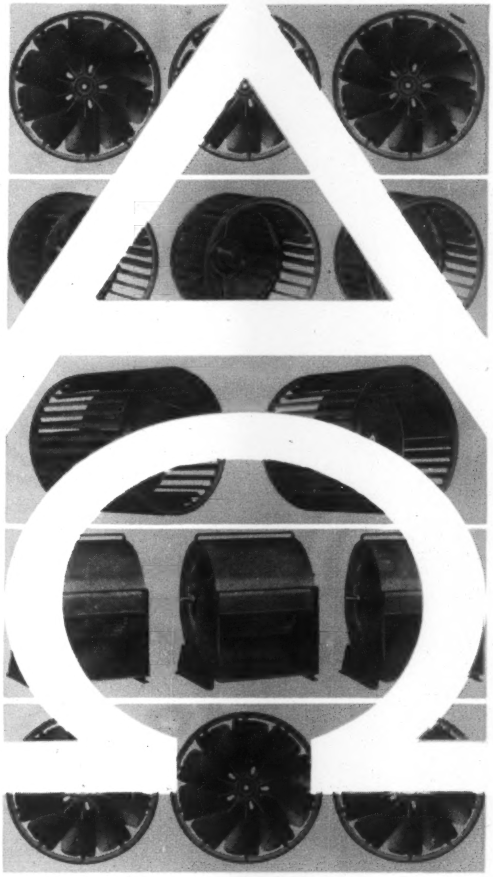


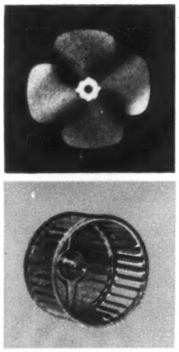
Floor-mounted units may be stationed in or away from area served.

Progress Is Our Most Important Product

GENERAL ELECTRIC

In Canada, Canadian General Electric Co., Ltd., Montreal.





ALPHA TO OMEGA

In the design, development and production of the three basic lines of air impellers—fans, blower wheels and complete blower units—Torrington technology is the finest available to industry.

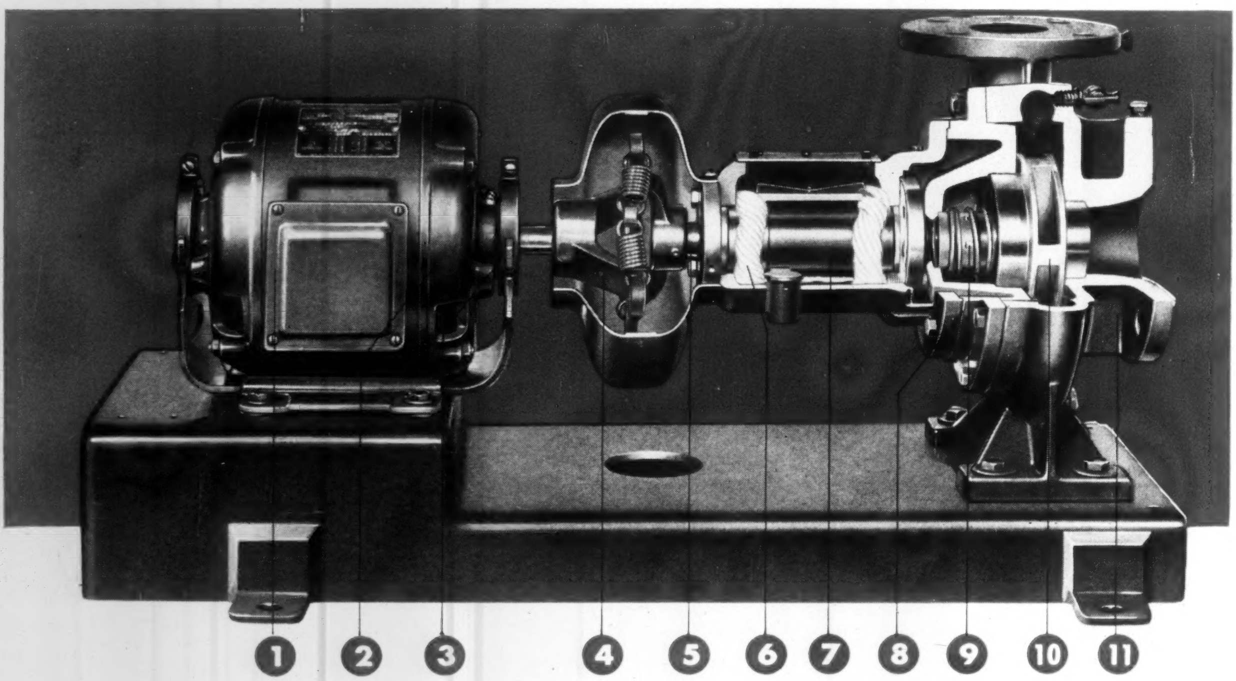
To date, more than half a million design variations of these three types of air impellers have been developed in the successful solution of industrial air moving problems.

No matter what *your* product or problem, if it involves the movement of air... *talk to Torrington!*

THE TORRINGTON MANUFACTURING COMPANY

TORRINGTON, CONNECTICUT • VAN NUYS, CALIFORNIA • OAKVILLE, ONTARIO

FOR CIRCULATING WATER *Silently*



B & G UNIVERSAL PUMPS . . . for larger installations

The circulating pump in a hot water heating or chilled water cooling system is the connecting link between the mechanical equipment in the boiler room and the structure itself. *Silent, vibrationless* operation is therefore the prime requirement in a pump for this type of service. The features noted above are the reasons why the B&G Universal Pump fully meets this need.

THE MOTOR

1. **Extra quiet.** The Universal Pump motor is specially constructed, tested and hand-picked for extra-quiet operation.

2. **Sleeve bearings.** Motors are equipped with oil lubricated sleeve bearings—essential to silent operation and long life.

3. **Mounting.** Universal motors, through 5 HP, are NEMA ring-type mounted and completely suspended in noise-dampening rubber. All motors are drip-proof.

THE PUMP

4. **Coupler.** Self-aligning, spring-type . . . another warranty of silent operation, plus excellent pump and motor protection against the stresses of starting torque.

5. **Shaft.** Big—oversized—affording large bearing surfaces. Made of special alloy steel, polished to mirror finish. Heat-treated integral thrust collar absorbs end-thrust . . . lengthens seal and motor bearing life.

6. **Lubrication.** Genuine oil circulating. No grease to channel or harden. Oil level indicator permits visual check.

7. **Sleeve bearings.** An essential for quiet, vibrationless operation and long life of both pump and motor. An outstanding Universal feature.

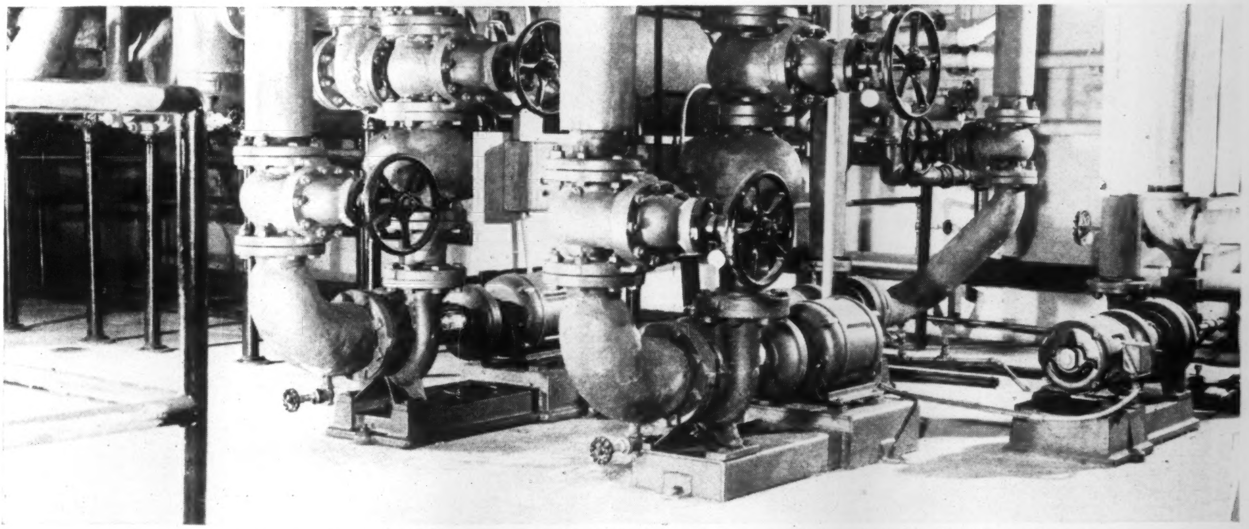
8. **Vertical split case—removable bearing frame.** The entire bearing frame assembly with impeller is easily removed from volute. No pipe connections to break or motor to remove . . . all the advantages of split case design. All bearing frame assemblies are interchangeable.

9. **"Remite" mechanical seal.** Positively prevents water leakage up to full design pressures. The seal is self-lubricating and features a floating seat of diamond-hard "Remite"—a B&G development.

10. **Hydraulically balanced impeller.** Balancing chamber and thrust pressure relief holes in the impeller reduce thrust to a minimum.

11. **Solid volute.** Support feet directly below volute absorb piping strains without distorting pump alignment.

IN HEATING AND COOLING SYSTEMS



Battery of silent B&G Universal Pumps circulating a two-pipe, reverse return hot water heating system.

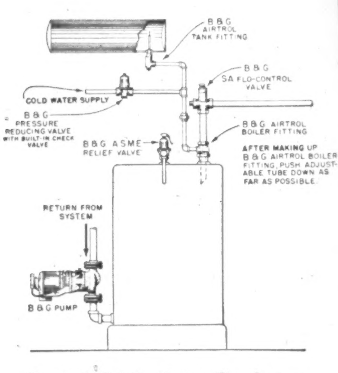
B & G BOOSTER PUMPS

The fact that over 2,000,000 B&G Boosters are in operation today is ample evidence that their quality has never been challenged.

These pumps satisfy the most exacting requirements of circulated water systems for heating and cooling. Above all they are *quiet, vibrationless*... the prime essential of a circulating pump. B&G Boosters are dependable, perform faithfully for years without endless minor and major repairs. They are backed by a manufacturer equipped to give assistance in any problem of design or installation and whose distributors maintain adequate stocks to serve your needs.

For a complete description of the features which have made the B&G Booster the preferred pump, send for Bulletin IA-856.

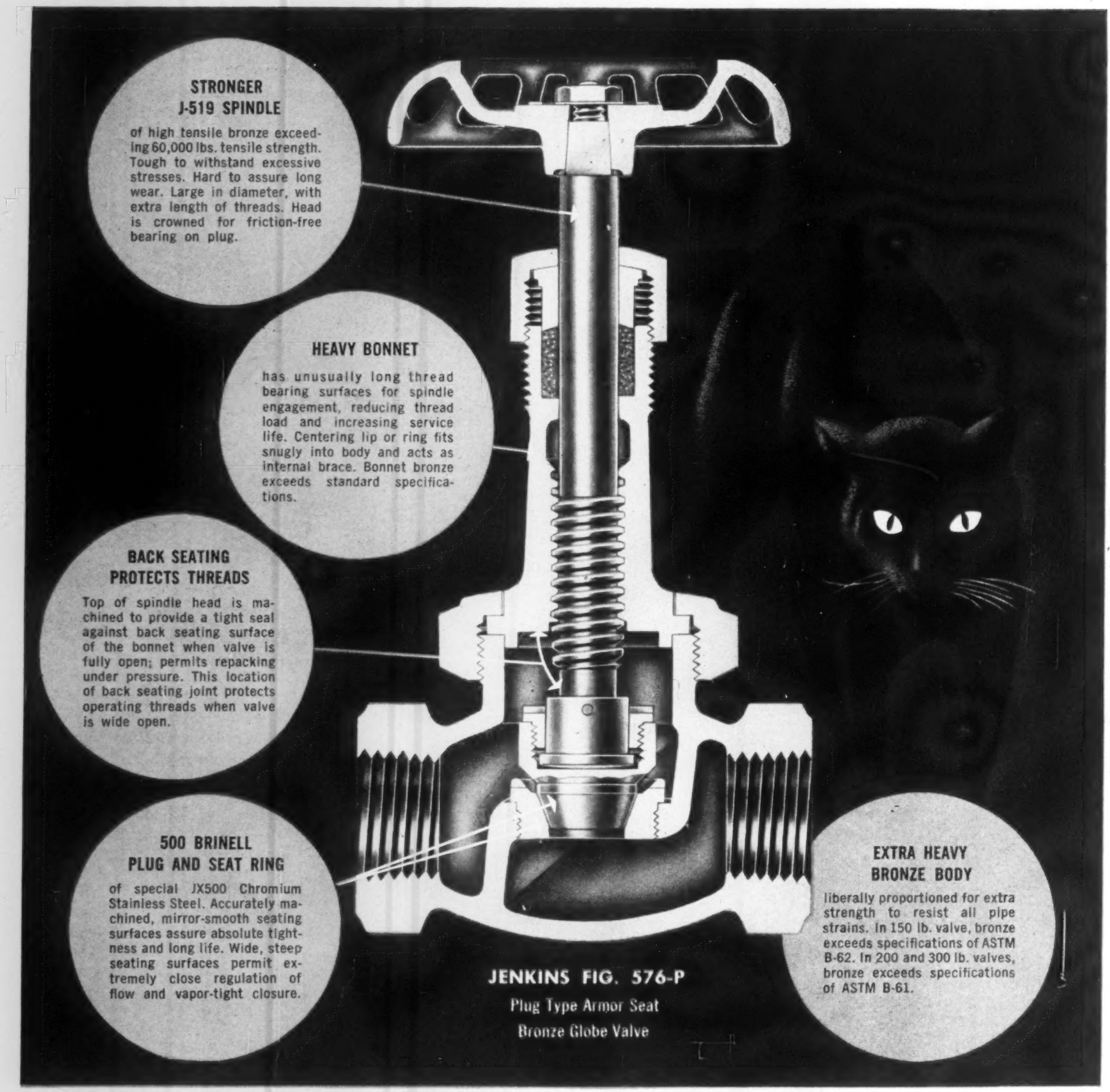
The 300 homes of this building project are heated with B&G Hydro-Flo forced hot water systems.


B & G AIRTROL TANK FITTING
B & G SA FLO-CONTROL VALVE
COLD WATER SUPPLY
B & G PRESSURE REDUCING VALVE WITH BUILT-IN CHECK VALVE
B & G AIRTROL BOILER FITTING
B & G ASME RELIEF VALVE
AFTER MAKING UP B & G AIRTROL BOILER FITTING, PUSH ADJUSTABLE TUBE DOWN AS FAR AS POSSIBLE.
RETURN FROM SYSTEM
B & G PUMP

Typical B&G Hydro-Flo System with built-in domestic water heater.

BELL & GOSSETT
COMPANY
Dept. ET-5, Morton Grove, Illinois
Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, W. Toronto

Where valves need 9 lives...



STRONGER J-519 SPINDLE

of high tensile bronze exceeding 60,000 lbs. tensile strength. Tough to withstand excessive stresses. Hard to assure long wear. Large in diameter, with extra length of threads. Head is crowned for friction-free bearing on plug.

HEAVY BONNET

has unusually long thread bearing surfaces for spindle engagement, reducing thread load and increasing service life. Centering lip or ring fits snugly into body and acts as internal brace. Bonnet bronze exceeds standard specifications.

BACK SEATING PROTECTS THREADS

Top of spindle head is machined to provide a tight seal against back seating surface of the bonnet when valve is fully open; permits repacking under pressure. This location of back seating joint protects operating threads when valve is wide open.

500 BRINELL PLUG AND SEAT RING

of special JX500 Chromium Stainless Steel. Accurately machined, mirror-smooth seating surfaces assure absolute tightness and long life. Wide, steep seating surfaces permit extremely close regulation of flow and vapor-tight closure.

EXTRA HEAVY BRONZE BODY

liberally proportioned for extra strength to resist all pipe strains. In 150 lb. valve, bronze exceeds specifications of ASTM B-62. In 200 and 300 lb. valves, bronze exceeds specifications of ASTM B-61.

JENKINS FIG. 576-P
Plug Type Armor Seat
Bronze Globe Valve

Install this JENKINS...made to defeat valve-killers

HERE are just five of the eighteen ways by which Jenkins Plug Type Valves have been engineered for maximum wear in valve-killing services. For any close-control steam service like drains, bypass lines, drips, blowoff, throttling, bleeders . . .

Or where abrasion, entrapped pipe chips, scale or rust tubercles are a problem . . .

You'll cut maintenance and replacement costs by specifying *"Jenkins Plug Type, with the 500 Brinell Stainless Steel Armor Seat"*. In the Jenkins Catalog are 150 lb., 200 lb. and 300 lb., Globe and Angle, screwed or flanged end valves in a full range of sizes. And, they are available quickly from local distributors' stocks.

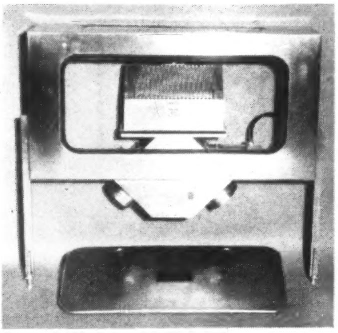
WRITE us, or ask your Jenkins distributor for descriptive folder No. 202-A. Jenkins Bros., 100 Park Avenue, New York 17.

JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES
SINCE 1864
TRADE JENKINS MARK
Jenkins Bros

Sold Through Plumbing-Heating and Industrial Distributors

EQUIPMENT DEVELOPMENTS . . .

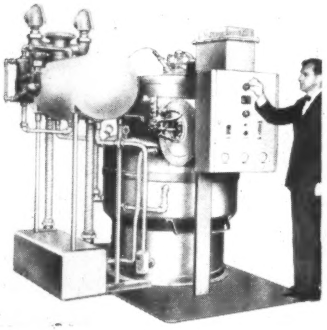
For reviews of Recent Trade Literature see Page 264



Air Mixing Units . . .

. . . with all-aluminum construction—*Buensod-Stacey, Inc., Dept. HPAC, 45 W. 18th St., New York 11.*

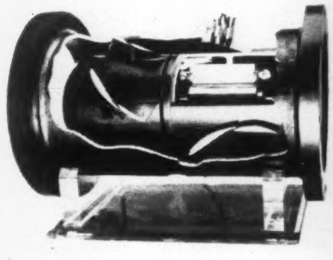
Unit is basic component in company's dual duct installations, in which streams of hot and cold air are forced through building in twin ducts and mixed in each room or area to meet individual requirements. Warm and cold air arrive by dual ducts at bottom, are mixed in response to thermostatic settings in bellows arrangement behind metal cover. Cited feature is automatic volume control which assures constant volume of air.



Water Tube Boiler . . .

. . . with new drum type construction—*Vapor Heating Corp., Dept. HPAC, 6420 W. Howard St., Chicago 31.*

150 hp unit, shown, is about 1/3 size of conventional boiler of same capacity, says company. Designed to produce low pressure steam for heating industrial plants, other commercial buildings. Other models of unit designed to produce steam at up to 125 psi. Equipped with steam temperature limit control, two safety valves, outfire control, low water shutoff.



Vaneaxial Blower . . .

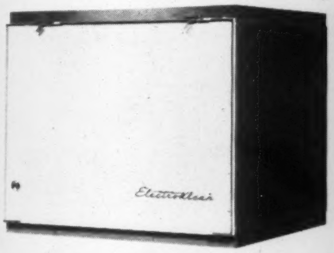
. . . with slotted airfoils designed to produce increased performance—*Electric Boat Div., General Dynamics Corp., Dept. HPAC, Groton, Conn.*

To soon be available for air conditioning, ventilation applications, says company. Uses aerodynamic principle of boundary layer control, said to achieve quietness with small size and high efficiency. Other cited features include reduction in space and weight, motor stator frame integral with fan casing and guide vanes, assembly balanced, one basic housing for various fan performance ratings, low tip speeds.

Baseboard Radiation . . .

. . . with new design changes—*Schemenauer Mfg. Corp., Dept. HPAC, 110 Kittle Rd., Holland, Ohio.*

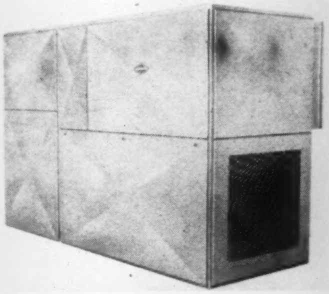
Radius of damper vane has been changed to correspond with that of front and back panels. Hanger bracket redesigned for more effective damper arrangement, added rigidity to front panel. End cap and access panel combined as one unit. Enclosures shipped in 5, 6, 8 ft lengths.



Electronic Air Filter . . .

. . . for small shops, retail stores, showrooms, restaurants, clubs, etc.—*American Air Filter Co., Inc., Dept. HPAC, 373 Central Ave., Louisville.*

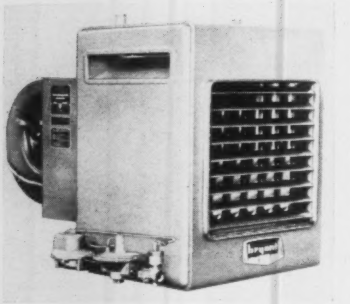
"Electro-Klean" is dry type unit, requires no water or sewer connections and is easy and inexpensive to install, says company. Mounted on return air side of air conditioner or forced air furnace. Existing ductwork can be utilized.



Air Conditioning Units . . .

. . . engineered for flexibility, ease of installation—*National-U.S. Radiator Corp., Dept. HPAC, Johnstown, Pa.*

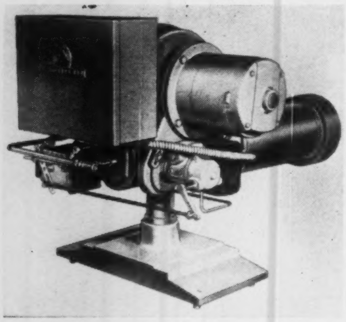
"Model AECR" packaged units designed for commercial, industrial applications where water supply is limited. Available in 12 arrangements. Sectional construction permits remote location of one of components when necessary. Available in 7½, 10, 15, 22½, 30, 40, 50, 60 hp sizes. Cited feature is built-in evaporative condenser, said to reduce water comsumption to 95 percent.



Unit Heater . . .

. . . with centrifugal blower designed to be quiet operating—*Bryant Mfg. Co., Dept. HPAC,* 2020 *Montcalm, Indianapolis.*

Available in three sizes. 150,000 and 225,000 Btu per hr sizes feature belt drive blower assembly. Smaller 100,000 Btu per hr size has direct drive blower assembly. To provide quiet operation, all blower bearings and shaft are mounted in rubber, says company. For use with natural, mixed, manufactured, LP, LP-air gases and for dual fuel operation on natural and LP gases.



Oil Burners . . .

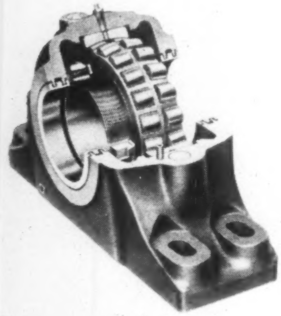
. . . for burning heavy No. 5 fuel oil —*Iron Fireman Mfg. Co., Dept. HPAC,* 3170 *W.* 106*th St., Cleveland.*

Recommended by company for automatic heating of commercial buildings. "MicroMist" units designed to atomize oil into fog. Heart of burner is superheater or compressor. Oil is atomized as oil and primary air pass into compressor. Compressor-atomizer further reduces oil spray, by heat of compression, to microscopic air-oil mist, says company. In models 3 to 25 gph.

Air Conditioners . . .

. . . for commercial, industrial applications—*Trane Co., Dept. HPAC, LaCrosse, Wis.*

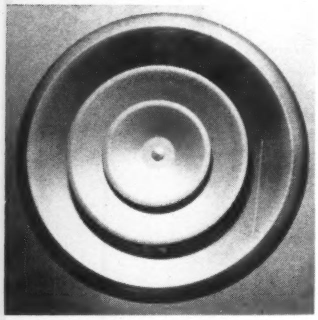
Ten and 15 ton capacity units added to "de luxe" self contained line. Require only minor electrical and piping connections, says company. With dual compressors and twin refrigerant cycles for more complete capacity modulation. Hermetic compressor-motor units installed suspended, mounted on vibration isolators.



Pillow Blocks . . .

. . . with unique mounting feature—*Dodge Mfg. Corp., Dept. HPAC, Mishawaka, Ind.*

"Micro-Mount" feature makes it possible to seat "Spher-Align" solidly on shafts quickly and easily, says company. Accomplished through use of set screws located parallel to bore in adapter nut. Available in expansion, non-expansion types in sizes to fit shafts 2 7/16 to 8 in. diameters.



Ceiling Diffusers . . .

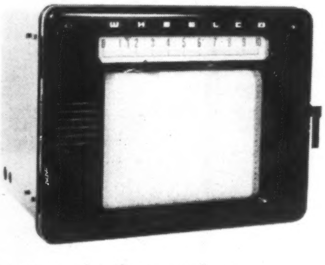
. . . designed for efficient air distribution, attractive appearance—*Universal Diffuser Corp., Dept. HPAC,* 38 *Marbledale Rd., Tuckahoe, N.Y.*

Center cores assembled in one unit in frame and held in outer cone by three locking points. Fabricated of steel, units receive preliminary rust preventative phosphate coat and two coats of baked enamel.

Hose Assemblies . . .

. . . designed for "superior" flexibility—*Flex-O-Tube Div., Flexonics Corp., Dept. HPAC, Maywood, Ill.*

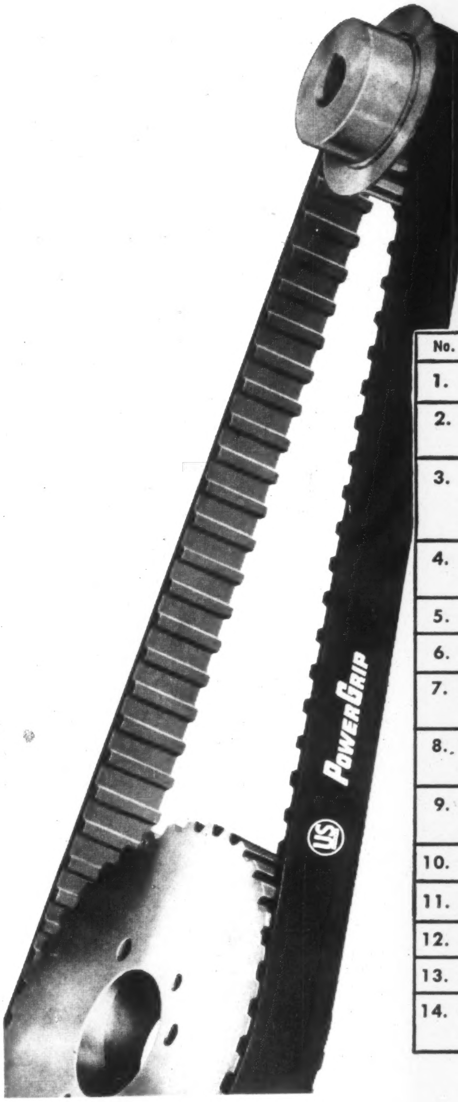
Constructed of smooth extruded "Teflon" tube with stainless steel wire braided covering. For working pressures to 3000 psi under certain temperature conditions, temperatures to 500 F when working pressures are not above 1000 psi. Recommended by company for handling chemical elements and compounds, gases and vapors, foods and drugs, other substances that would deteriorate other hose materials. In sizes 3/16 to 1⅛ in.



Electronic Recorder . . .

. . . engineered for permanent recording of up to 16 points on one chart—*Barber-Colman Co., Wheelco Instruments Div., Dept. HPAC, Rockford, Ill.*

Null-balance unit designed for long life, trouble-free service. Measurements obtained with sensing units such as thermocouples, radiation detectors, other devices where measured variable can be resolved into electrical signal.



"✓" in your transmission belt needs

No. Advantages	PowerGrip "Timing" Belt	Chain	Gear	V-Belts	Flat Belts
1. No need for lubrication	✓				
2. Positive elimination of slip and creep	✓				
3. Completely compact (Both in width and pulley diameter)	✓				
4. Lightweight (Heavy duty belt only 0.1 lb./ft./in.)	✓				
5. No noise or vibration	✓				
6. No initial tension	✓				
7. Unusual speed range (Speeds up to 12,000 FPM)	✓				
8. Efficient (Elim. heat, lube drag, high bearing loads)	✓				
9. Constant angular velocity (no speed fluctuation)	✓				
10. Minimum backlash	✓				
11. Design flexibility	✓				
12. Economical	✓				
13. No stretch	✓				
14. Can it be completely housed and forgotten?	✓				

Note that the U. S. PowerGrip "Timing" Belt takes a "✓" after every advantage

While every type of drive has certain advantages, *no* type of power transmission possesses *so many* advantages as the U.S. PowerGrip "Timing" Belt drive. For example, *it is the only positive drive that never needs lubrication.*

THE LIST OF USES GROWS DAY BY DAY! Power production machinery in every field is made more efficient, volume of production increased, and maintenance costs lowered with this amazing belt. The list of OEM applications grows too numerous to mention. U.S. PowerGrip has streamlined hundreds of products... made them sell above competition. Some equipment would not be in existence at all, if it weren't for this great belt.

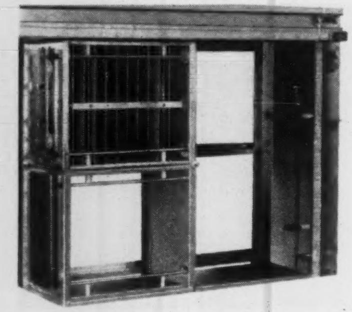
U. S. PowerGrip "Timing" Belt drives—from flea-power to 1000 h.p., and with ratios up to 12 to 1—are obtainable at any of the 28 "U. S." District Sales Offices, at selected "U. S." distributors, or by contacting us at Rockefeller Center, New York 20, New York. In Canada, Dominion Rubber Co., Ltd.

Send for free illustrated manual, complete with standard drive tables.

US RUBBER

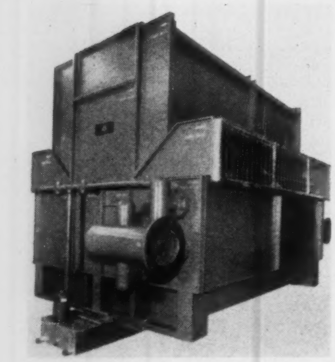
Mechanical Goods Division

United States Rubber



Electronic Air Cleaner . . .
. . . designed to be smaller, more efficient—*Sturtevant Div., Westinghouse Electric Corp., Dept. HPAC, Hyde Park, Boston* 36.

"Precipitron" developed specifically for commercial buildings. Removes air impurities by ionizing particles, collecting them on metal plates. Can be incorporated into any central heating or air conditioning system, says company. Varying number of separate dust-collecting cells used, according to size, requirements of system.

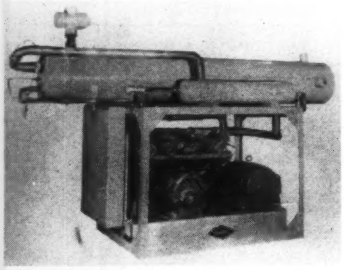


Aftercooler . . .
. . . in new, large capacity model—*Niagara Blower Co., Dept. HPAC,* 405 *Lexington Ave., New York* 17.

Designed to offer self contained method of cooling and removing moisture from compressed air, independent of large supply of cooling water and replacing both shell and tube cooler and cooling tower. Consists of two parallel mounted cooling coils (one for jacket water, one for compressed air) in separate casings joined to central plenum. In four sizes with capacities to 23,000 cfm of free air cooled from 275 F to 85 F at 75 F wet bulb atmospheric air, says company.

Air Conditioners . . .
. . . for through-the-wall installation—*Fedders-Quigan Corp., Dept. HPAC,* 58-01 *Grand Ave., Maspeth, N.Y.*

Known as "Wall-Fit" models, nine new units available in ¾, 1, 1½ hp capacities in two different sizes and for operation on every type of voltage, current. Models come with special "shell" for mounting in any size or type of wall construction, says company.

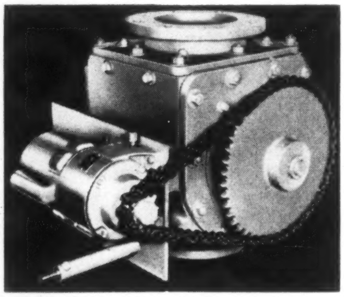


Water Chiller . . .
. . . designed to make summer air conditioning available in buildings heated with steam or hot water systems—*Unarco Air Conditioning Products, National-U.S. Radiator Corp., Dept. HPAC, Johnstown, Pa.*

Cited advantage of "CWG" is that cooling comfort can be piped through existing piping. Shipped as complete unit, is equipped with across-the-line starters, insulated heat exchanger and chiller, freeze-up prevention thermostat. Available in sizes 7½ to 75 hp.

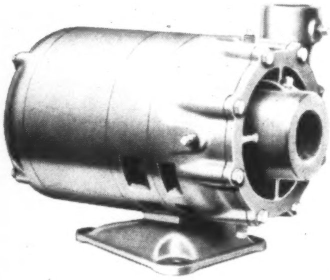
Filter . . .
. . . for use in temperatures to 2300 F—*Flanders Mill, Inc., Dept. HPAC, Riverhead, N.Y.*

Beyond 2300 F deterioration starts to take place which shortens life of filter at accelerated rate up to 3200 F. With rated efficiency 99.5 percent on 0.3 micron smoke, says company. Capacity is 0.5 in. water gage at 250 cfm per sq ft of face area.



Rotary Feeder . . .
. . . designed to handle dry, free flowing granulated solids—*Allen-Sherman-Hoff Co., Dept. HPAC, Wynnewood, Pa.*

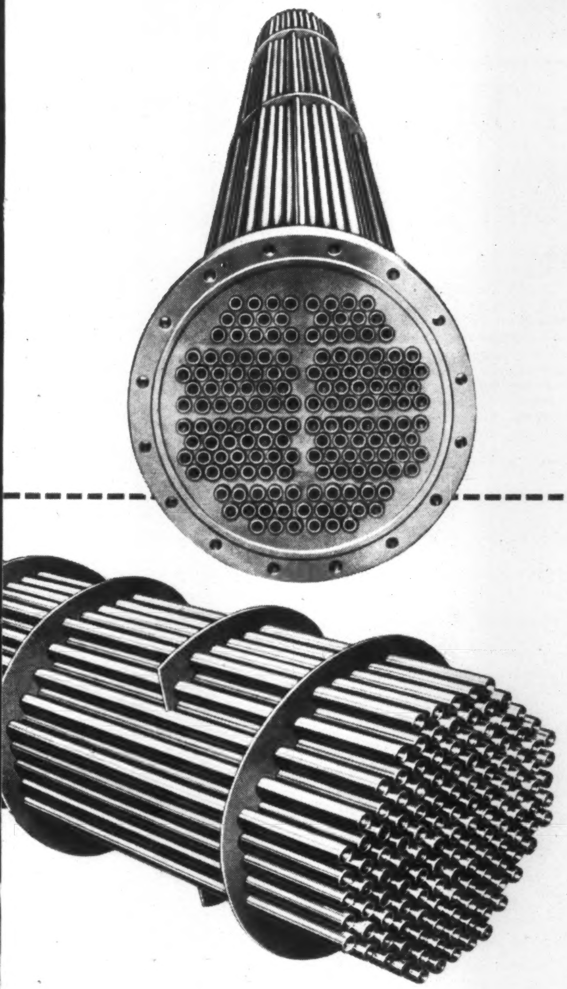
Features accurate feed control, positive shutoff, says company. Measured flow of material results from constant rotor speed and rotor and shoe design said to permit only specific amount of material to fall into each pocket. Shoe is cylindrical arc that contacts periphery of rotor blades and spans three rotor pockets. In addition to controlling material feed, shoe also insures positive shutoff, manufacturer states. In five sizes for attaching to 4, 6, 8, 10, 12 in. diameter pipe flanges.

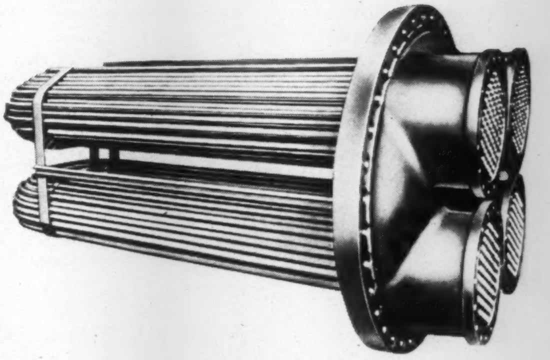


Centrifugal Pumps . . .
. . . in 2, 3, 5 hp sizes, rated 3450 rpm—*Sta-Rite Products, Inc., Dept. HPAC, Delavan, Wis.*

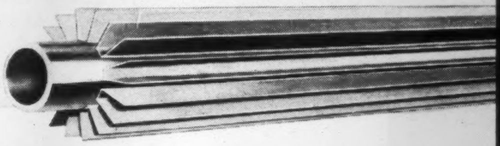
For capacities to 220 gpm, heads to 170 ft. "Type A" units have heavy duty, capacitor motor designed for continuous operation. With corrosion resistant "leakproof" mechanical seal. Bronze impeller engineered to provide friction free water channels. "Type AC" units, not shown, available in 1/4, 1/3, 1/2, 3/4, 1 1/2 hp models.

(*Continued on page* 222)



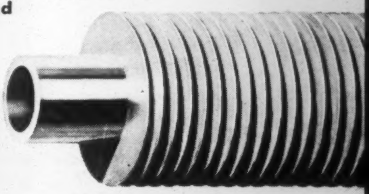


TWO GOOD WAYS TO ADD ADDITIONAL HEAT TRANSFER SURFACE AREA TO B&W CARBON STEEL ERW TUBES



(A) Longitudinal Channels Welded On

(B) Continuous Helical Fin Wound Around Tube and Welded On



TUBING REQUIREMENTS FOR HEAT TRANSFER EQUIPMENT

The economy and usefulness of pressure tubing in heat exchanger and condenser applications depend on the tubing's heat transfer ability and the ease with which it can be bent, coiled, swaged, and rolled into tube sheets.

Because of its uniform wall thickness, the heat transfer ability of B&W Electric-Resistance-Welded Carbon Steel Tubing is the optimum for such a ferrous material. It is an economical material to use, not only because of its reasonable first cost, but also because of its low fabrication cost, since ease of bending, coiling, swaging, and rolling into tube sheets is provided through quality-controlled methods used in its manufacture.

B&W Electric-Resistance-Welded Carbon Steel Heat Exchanger and Condenser Tubing is widely used in the process industries, including petroleum refining and chemical processing, and in refrigeration and steam generating equipment. If carbon steel tubing can do the job required, you will find B&W ERW Tubing provides maximum, trouble-free service life. For additional information, call on Mr. Tubes, your nearby B&W Tube Representative — *or write for Bulletin 412.* The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pa.

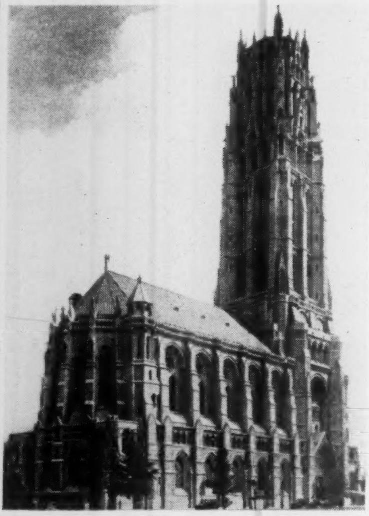
B&W

TUBULAR PRODUCTS DIVISION

TA 6099 PG-2

Seamless and welded tubular products, seamless welding fittings and forged steel flanges—in carbon, alloy, and stainless steels

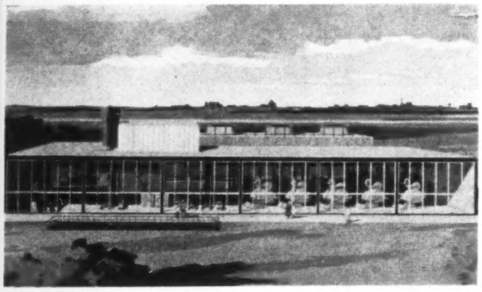
The Finest Buildings Deserve The Best—YULA



The Riverside Church, N.Y.C. Consulting Engineer, Meyer, Strong and Jones, N.Y.C. Mechanical Contractors, Kerby Saunders and Apex Oil Burner Co., N.Y.C.

Abraham Jacobi Hospital of the Bronx Municipal Hospital Center, Bronx, N. Y. Architects, Pomerance & Breines. Consulting Engineer, Guy B. Panero. Mechanical Contractor, Raisler Corp.

New York International Airport International Arrival & Airline Wing Bldgs. Consulting Architects, Skidmore, Owings & Merrill. Mechanical Contractor, E. J. Brandt.



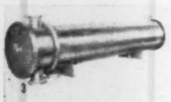
New York International Airport Central Heating & Refrigeration Plant — N. Y., N. Y. Architects, Skidmore, Owings & Merrill. Consulting Engineer, Seelye, Stevenson, Value and Knecht. Mechanical Contractor, Almirall & Co., Inc., and Norman Heating Co.

The Seagram Building — N.Y.C. Architects, Mies vander Rohe and Philip Johnson. Asso. Architects, Kahn & Jacobs. Consulting Engineer, Jaros, Baum & Bolles. Mechanical Contractor, Kerby Saunders. Photo courtesy Copper & Brass Research Association

YULA HEAT EXCHANGERS used in these buildings were selected because they are a quality product recognized universally by Architects, Engineers and Contractors.

Yula Water Heaters, Inc. 330 Bryant Ave., New York 59, N. Y.

1



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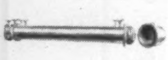


5

2

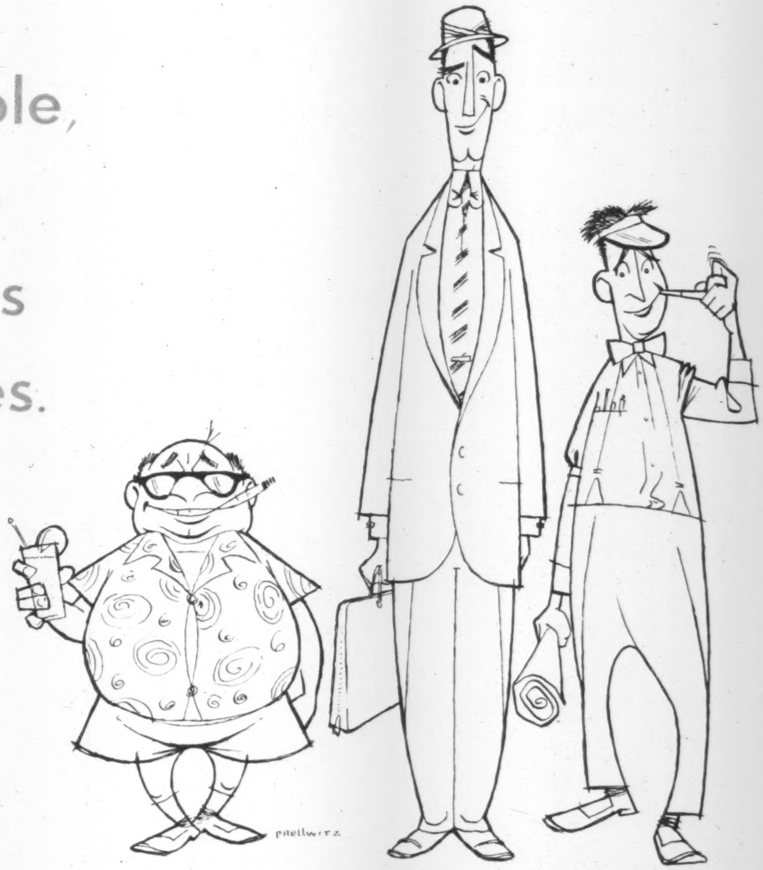
4

1. Straight-Tube Channel Type Convertor
2. Instantaneous Water Heater
3. Channel Type Interchanger
4. Suction Oil Heater
5. Floating Head Exchanger

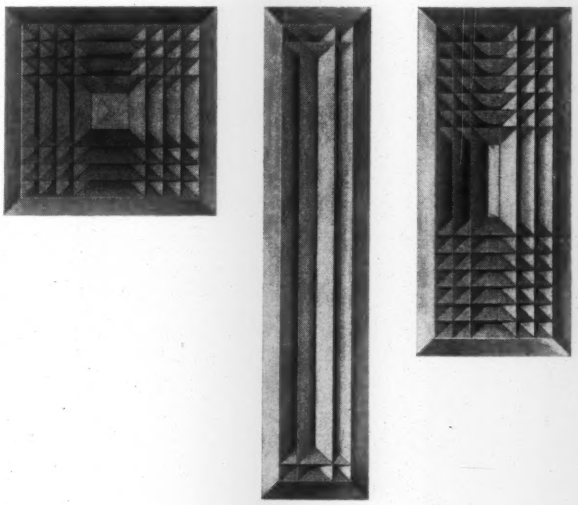
Yula

HEAT-TRANSFER EQUIPMENT

Just like people,
we come
in all shapes
and sizes.



ADP



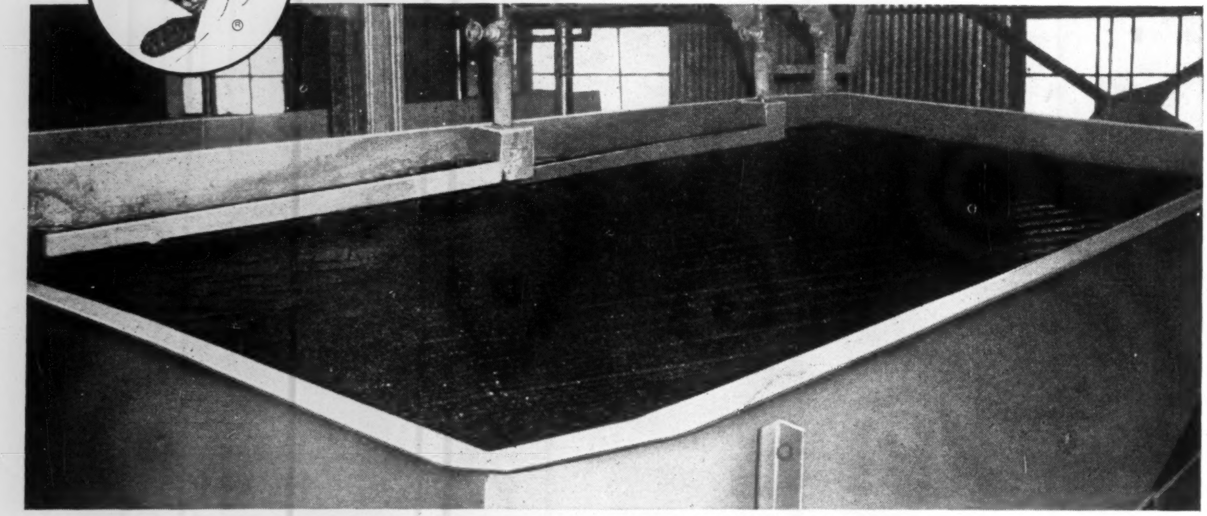
ADP diffusers come
in squares, rectangles
and continuous units.
Sizes and types to
meet any requirement.
Available with
removable core and
supply and return
air combinations.
Engineered for better
air distribution.

AIR DIFFUSION PLUS

AIR DISTRIBUTION PRODUCTS

116 South La Brea Avenue **Los Angeles 36, California**

WHY CHESSIE'S RAILWAY IS FIRST IN COAL



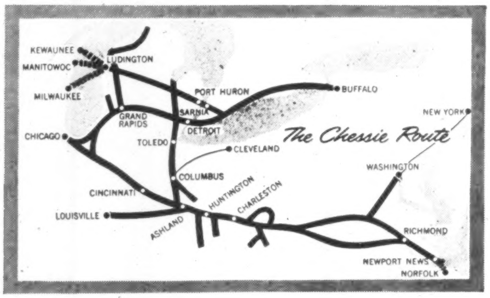
SUPERIOR COAL. This Deister Table for washing slack is an example of the up-to-date methods employed by producers on the C & O to give you the highest quality and performance in the type of coal best suited to your needs. Superior coal means lower ultimate cost.

SUPERIOR SERVICE. Chesapeake and Ohio operates the world's largest fleet of coal cars with ample power to move them. By its prompt repair program C&O keeps more than 99% of these cars in good order. And C&O's new car reporting system can give you the exact location of any car on C & O lines at any time.

For dependable deliveries of top quality coals, contact coal producers on the C&O. And if you need help in meeting your own particular fuel requirements, write to: R. C. Riedinger, General Coal Traffic Manager, Chesapeake and Ohio Railway Co., Terminal Tower, Cleveland 1, Ohio.

Chesapeake and Ohio Railway

WORLD'S LARGEST CARRIER OF BITUMINOUS COAL


KEWAUNEE
MANITOWOC
LUDINGTON
MILWAUKEE
PORT HURON
BUFFALO
SARNIA
GRAND RAPIDS
DETROIT
NEW YORK
CHICAGO
TOLEDO
CLEVELAND
The Chessie Route
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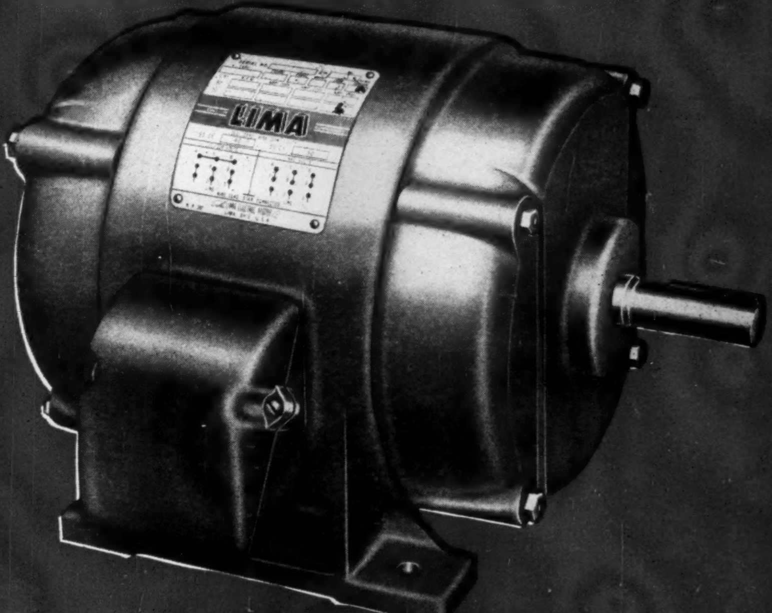
A New Approach to Perfection

MAINTENANCE-FREE

LIMA MOTORS

IN ALL NEW NEMA FRAME SIZES

- 30% LESS WEIGHT PER HORSEPOWER
- 30% VOLUMETRIC SIZE REDUCTION
- DUAL FANS INTEGRALLY CAST WITH ROTOR
- COMPLETE ROTOR ASSEMBLIES DYNAMICALLY BALANCED
- RIGID, CAST IRON FRAMES WITH INTEGRALLY CAST FEET
- DIAGONALLY SPLIT CAST ALUMINUM CONNECTION BOXES—CADMIUM PLATED COVER SCREWS
- TOTALLY ENCLOSED FRAMES MEET J.I.C. SPECIFICATIONS

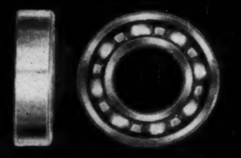


Slash maintenance costs and eliminate costly inspection and lubrication programs with Lima Motors in NEW NEMA frame sizes. With lubricated-for-life DOUBLE-WIDTH ball bearings, solid die cast aluminum rotors with dual integral fans, and Mylar insulation . . . Lima gives you higher full-load speeds with the most complete motor protection available. Install these new Finest Quality Lima Motors—and forget them.

Lima now has in production all ratings in new NEMA frame sizes 182 through 326U. Get complete details on Lima's new NEMA *maintenance-free* motors from your Lima Representative now! If he is not already calling on you, his name and address will be found in *Thomas' Register*, *MacRae's Blue Book* or *Conover-Mast Purchasing Directory*.

Of course, Lima will continue to produce regular NEMA frame sizes 66 to 505 (⅓ to 150 H.P.), incorporating the latest advances in motor design.

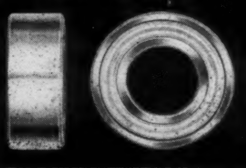
SINGLE-WIDTH UNPROTECTED



THE OLD WAY

Open and unprotected motor bearings subject to contamination and must be inspected and lubricated frequently.

DOUBLE-WIDTH FULLY PROTECTED



THE LIMA WAY

Sealed and protected—Lima's DOUBLE-WIDTH pre-lubricated motor bearings require no attention—just put the motor to work and forget it.

THE LIMA ELECTRIC MOTOR COMPANY, 4991 Findlay Road Lima, Ohio

Representation throughout the U. S., Canada and abroad

ELECTRIC LIMA MOTORS

FIRST . . . FOR MOTORS . . . DRIVES . . . SPEED REDUCERS

USG®

. . . trademark of
DEPENDABILITY

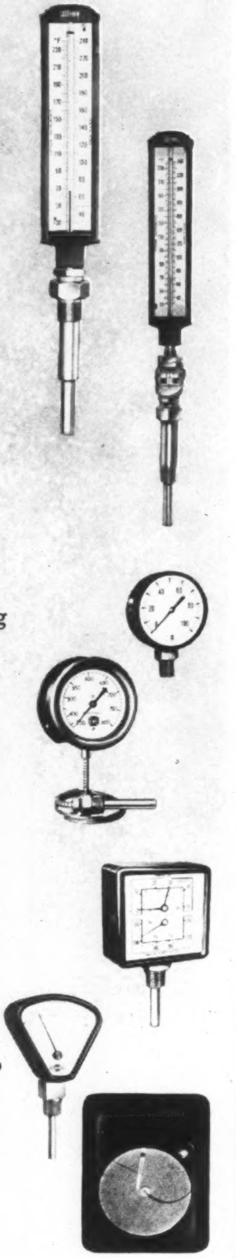
for every heating
and air conditioning
application

To contractors, heating and air conditioning engineers, and equipment manufacturers, the USG trade mark is synonymous with ACCURACY, RUGGEDNESS, DEPENDABILITY.

Contractors will tell you that gauge for gauge—in every application classification—in every price range—you get more value with USG. These qualities, among others, influence more original equipment manufacturers to specify USG than any other make.

TO CONTRACTORS—Your USG Distributor has in stock, or can get for you fast, any quantity of gauges you want for any application. Consult the yellow pages of your directory or write us for the name of the distributor in your area.

TO EQUIPMENT MANUFACTURERS—For help in keeping your standard gauge and thermometer costs low, or in obtaining special types . . . write either the nearest U. S. Gauge field office or the factory. Our engineering staff and research laboratory are at your service.

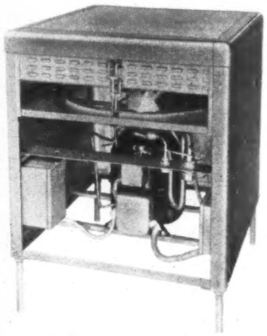


USG
UNITED STATES GAUGE
Home of the SUPERGAUGE
Division of American Machine and Metals, Inc.
Sellersville, Pa.

MORE THAN 50,000 TYPES OF GAUGES • SUPERGAUGES • SOLID FRONT GAUGES • RECEIVER GAUGES • TEST GAUGES • RECORDERS • CONTROLLERS • TRANSMITTERS • PSYCHROMETERS • AVIATION INSTRUMENTS

EQUIPMENT DEVELOPMENTS

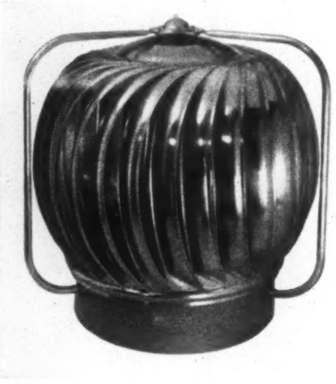
Continued from page 216



Air Cooled Condensers . . .

. . . designed for economical unit installation in small stores, offices—*Typhoon Air Conditioning Co., Div. of Hupp Corp., Dept. HPAC, 505 Carroll St., Brooklyn 15.*

"Thrifti-Kool" line consists of 2, 3, 5 hp units. Provided with hermetic compressors, units use fluorinated hydrocarbon refrigerant No. 22. Cooling capacities are 18,200, 33,200, 56,000 Btu, respectively.



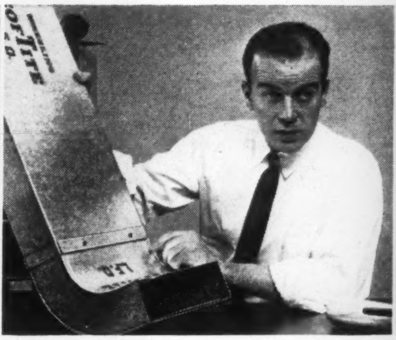
Turbine Ventilator . . .

. . . with ground deep groove ball bearing mounted in self aligning, shielded bearing housing—*Greenheck Fan & Ventilator Corp., Dept. HPAC, Schofield, Wis.*

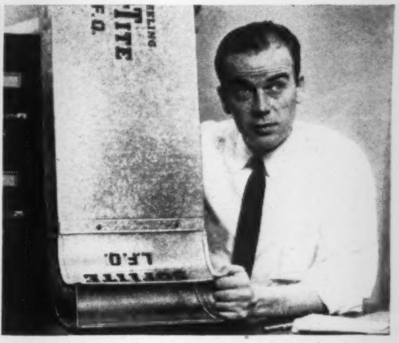
Bearing has basic load rating of 300 lb. Housing designed to permit bearing to run freely with no binding due to misalignment, says company. Bearing shielded from dust and moisture and packed with light grease with low viscosity over wide temperature range. Has weather resistant aluminum rotor. Rotating unit, bearings suspended in rubber.

WHEELING
SOFTITE
L.F.Q.

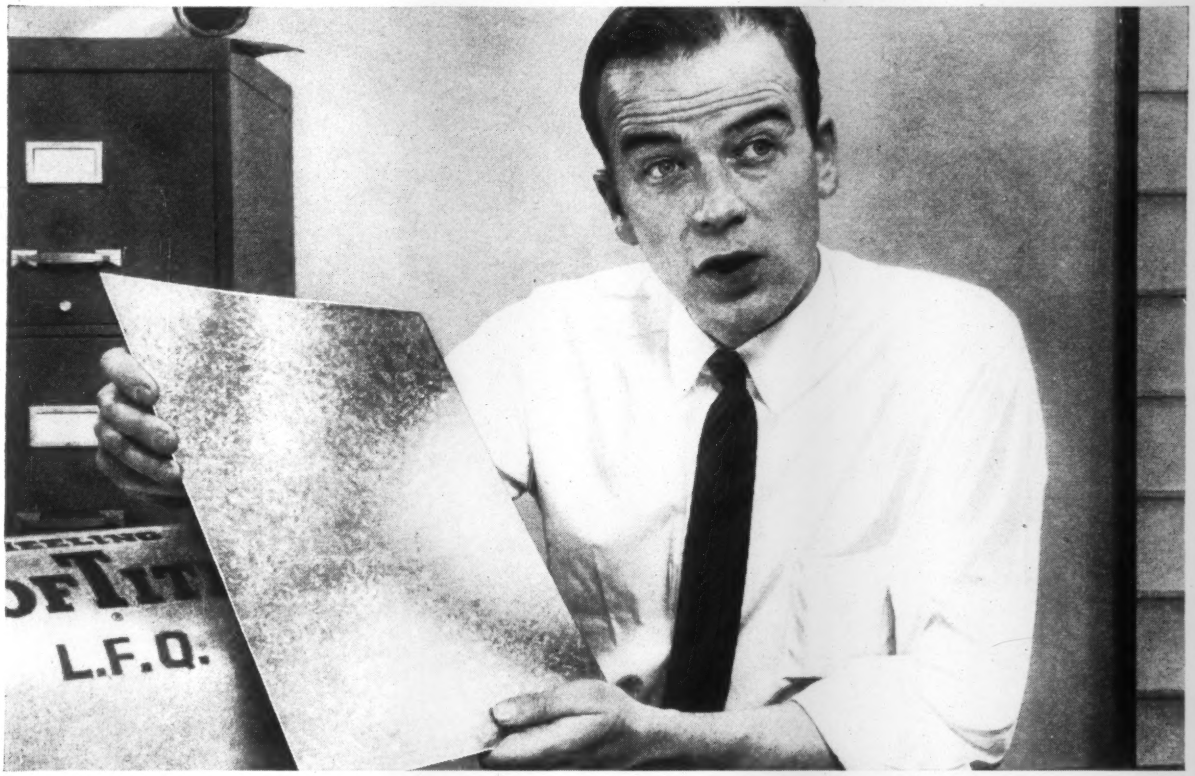
"We can make the most severe operations . . .



and the tightest joints and locks . . .



without fear of the zinc coat cracking because . . .



Wheeling SOFTITE® has the tightest zinc coating yet produced"

Air conditioning engineers and sheet metal fabricators are discovering untold new economies using Wheeling SOFTITE Galvanized Sheets.

For one thing, here is a sheet that really *likes* to be worked. It's soft and ductile, easy to form, easy to crimp. But more, SOFTITE has a tight zinc coating that's almost impossible to chip or flake no matter how severely it is fabricated.

And so Wheeling SOFTITE lasts far longer. Likewise ducts made of SOFTITE.

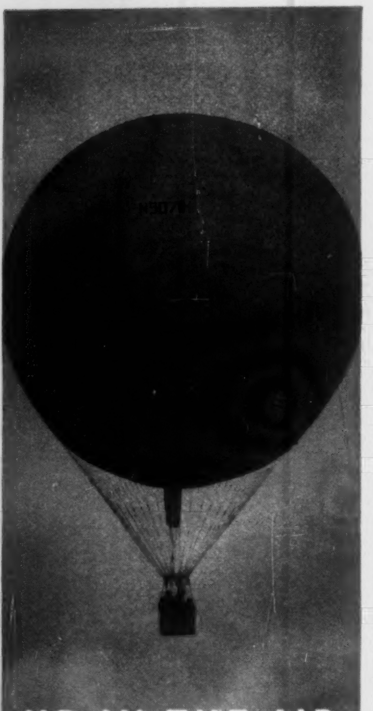
If you are not getting performance like this from your present galvanized sheet, or if you are using ordinary steel sheets for fear that a galvanized sheet can't take the strain, Wheeling SOFTITE may be your answer.

Call your Wheeling industrial supply distributor, the Wheeling sales office nearest you, or write Wheeling Steel Corporation, Wheeling, West Virginia.

IT'S WHEELING STEEL

DISTRICT SALES OFFICES—Atlanta, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Houston, New York, Philadelphia, St. Louis, San Francisco, Wheeling

OUR CHALLENGE STANDS: ANYTHING THAT CAN BE MADE OF STEEL SHEETS CAN BE MADE OF WHEELING SOFTITE GALVANIZED SHEETS



UP IN THE AIR

ABOUT FAN SELECTION?

. . . order Chicago Airfoil Bladed Fans

Aerodynamically shaped blades cut H.P. up to 35% and move more air with 65% less noise. Fans rated 600 to 1 million cfm.

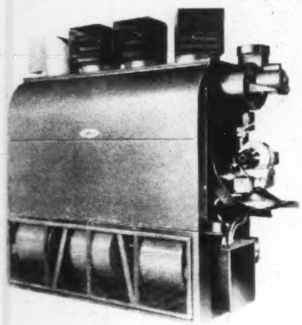
Write for Bulletin A-102M

CHARTER MEMBER of A.M.C.A.

CHICAGO BLOWER CORP.

9865 Pacific Ave., Franklin Park, Ill.

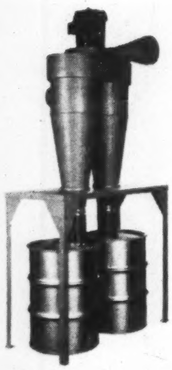
See Phone Directory for Sales Offices



Heat Diffuser . . .

. . . designed to provide inexpensive central heat for schools, churches, factories, warehouses, other large area buildings—*Carrier Corp., Dept. HPAC, Syracuse* 1, *N. Y.*

No central boiler required. Factory wiring and prefiring make installation easy, says company, only fuel and electrical connections have to be made and unit vented before it is ready for operation. Direct gas or oil fired units available in 10 sizes 300,000 to 2 million Btu.

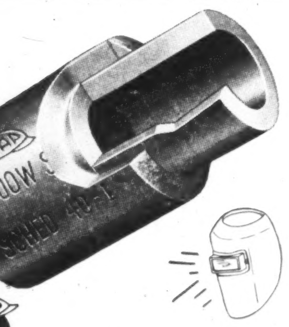


Dust Collector . . .

. . . engineered for trapping large volumes of bulky dust from air—*Torit Mfg. Co., Dept. HPAC,* 287 *Walnut St., St. Paul* 2.

"219-FB-55" unit fitted with connections to standard 55 gal drums. Recommended by company for use with machinery that creates great quantities of dust, buffing lint, chips or shavings. Air-tight sealing feature on drum cover eliminates need for clamps, and drums can be changed in 30 seconds, says manufacturer.

Perfect FIT FOR PERFECT Welds



CAP Capitol

SOCKET WELD COUPLINGS and CAPS for permanent high-pressure installations

All sizes, 1/8" through 4", Socket Weld Couplings and Caps are available for immediate shipment. Machined from special welding quality steel for better and more permanent installations, these couplings and caps meet the following specifications:

ASTM A-105-46 Grades 1 and 11
ASTM A-106-48T Grades 1 and 11
ASTM A-181-46 Grades 1 and 11

Extra Profit!

Order all of your coupling requirements from

CAP CAPITOL
MFG. & SUPPLY CO.
COLUMBUS, OHIO

COUPLINGS — NIPPLES — UNIONS — BUSHINGS — PLUGS — REDUCERS — CAPS—CAPADAPTERS—WELL SUPPLIES

224 Instrument Tubes in 22 Runs of

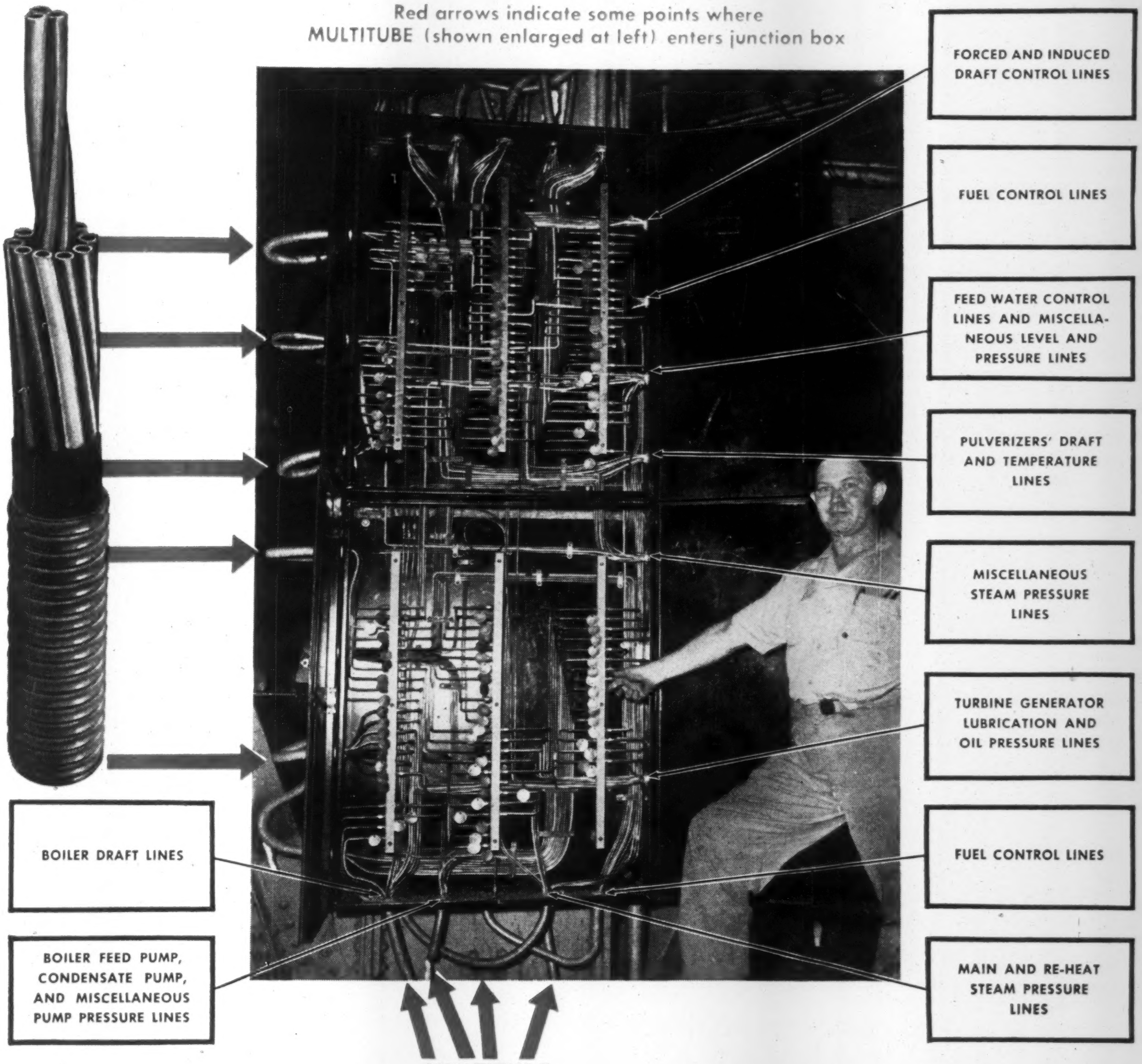
CRESCENT ARMORED MULTITUBE

in This Control Board Junction Box

Complete protection at substantially lower installed cost is provided by the 22 Runs of 1/4 inch O D copper tubes used in this installation at the Long Island Lighting Co.'s 100,000 K.W. generator, steam turbine and boiler unit.

It is in making this type of installation that you can really make a profit because CRESCENT ARMORED MULTITUBE* is a group of tubes *spirally cabled* together. The installer doesn't have to handle a number of individual tubes — there is just one unit to work with. This system means fewer connections and fittings, lower cost for supports or racks, ease of mounting, and less space. This product is licensed under U.S. Patent No. 2,578,280.

Red arrows indicate some points where MULTITUBE (shown enlarged at left) enters junction box

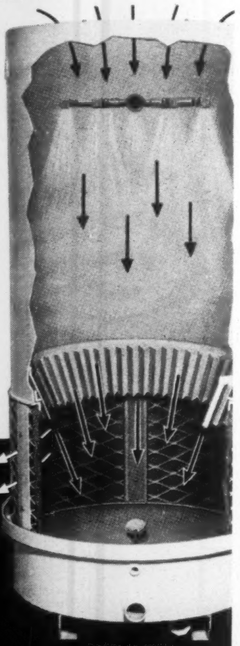

FORCED AND INDUCED DRAFT CONTROL LINES
FUEL CONTROL LINES
FEED WATER CONTROL LINES AND MISCELLANEOUS LEVEL AND PRESSURE LINES
PULVERIZERS' DRAFT AND TEMPERATURE LINES
MISCELLANEOUS STEAM PRESSURE LINES
TURBINE GENERATOR LUBRICATION AND OIL PRESSURE LINES
FUEL CONTROL LINES
MAIN AND RE-HEAT STEAM PRESSURE LINES
BOILER DRAFT LINES
BOILER FEED PUMP, CONDENSATE PUMP, AND MISCELLANEOUS PUMP PRESSURE LINES
MULTITUBE

Send For Technical Bulletin No. 356-I With Complete Engineering Data

CRESCENT INSULATED WIRE & CABLE CO.

TRENTON 5, NEW JERSEY

*** Reg. Trade Mark**



hit of the show
you saw it in action at the International Exposition

FORCED DRAFT! NO FAN!

KOCH
JET forced draft
COOLING TOWER

nothing cools like water!
Here is the tower that permits you to take full advantange of the efficiency and dependability of water-cooled condensers.

lower cost!
no moving parts!
attractive—compact!

Sizes to match all self-contained air conditioners 3 to 25 tons

AMAZINGLY SIMPLE DESIGN!
SIMPLY AMAZING PERFORMANCE!

Inlet Diffuser / Inductor Nozzles
Powerful Jet Action Forces Air /
500 F P M Velocity / Assures Intimate
Contact with Water / Self-Cleaning
Dynamic Sprays / No wood Fill /
360° Glass Eliminator / Plasticlad Finish Top to Bottom /

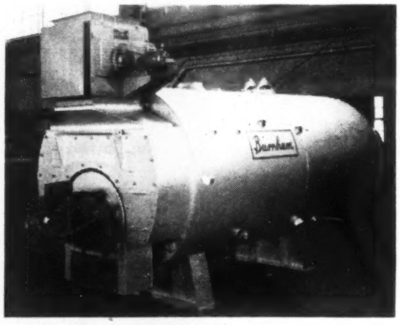
a word about the manufacturer

Koch Engineering Company, as a basic oil industry equipment manufacturer for more than 30 years, is world famous for its developments in heat transfer refinery processes.
The same engineering skill that makes Koch outstanding in the oil industry has gone into the manufacture of the revolutionary Koch Jet Action Cooling Tower.

KOCH
ENGINEERING CO.
321 West Douglas
Wichita, Kansas

A few areas are open for Manufacturer's Representatives. Write for information.

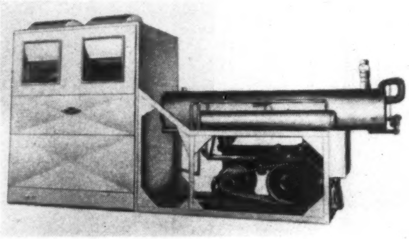
Powered by 5 hp, 3450 rpm motor. Collector pulls 2000 cfm of air through 8 in. inlet at 2.8 in. WG static pressure.



Scotch Type Steel Boiler . . .

. . . for oil, gas, combination oil-gas firing—*Burnham Corp., Dept. HPAC, Irvington, N.Y.*

Has easy-to-open, hinged cleanout doors both front and rear for cleaning or replacement of tubes, says company. In 14 sizes: from net SBI rating of 4000 to 35,000 EDR steam, 6400 to 56,000 EDR water. Also available as package boiler-burner unit furnished with steel skids.



Packaged Water Chillers . . .

. . . with built-in evaporative condensers—*Unarco Air Conditioning Products, National-U.S. Radiator Corp., Dept. HPAC, Johnstown, Pa.*

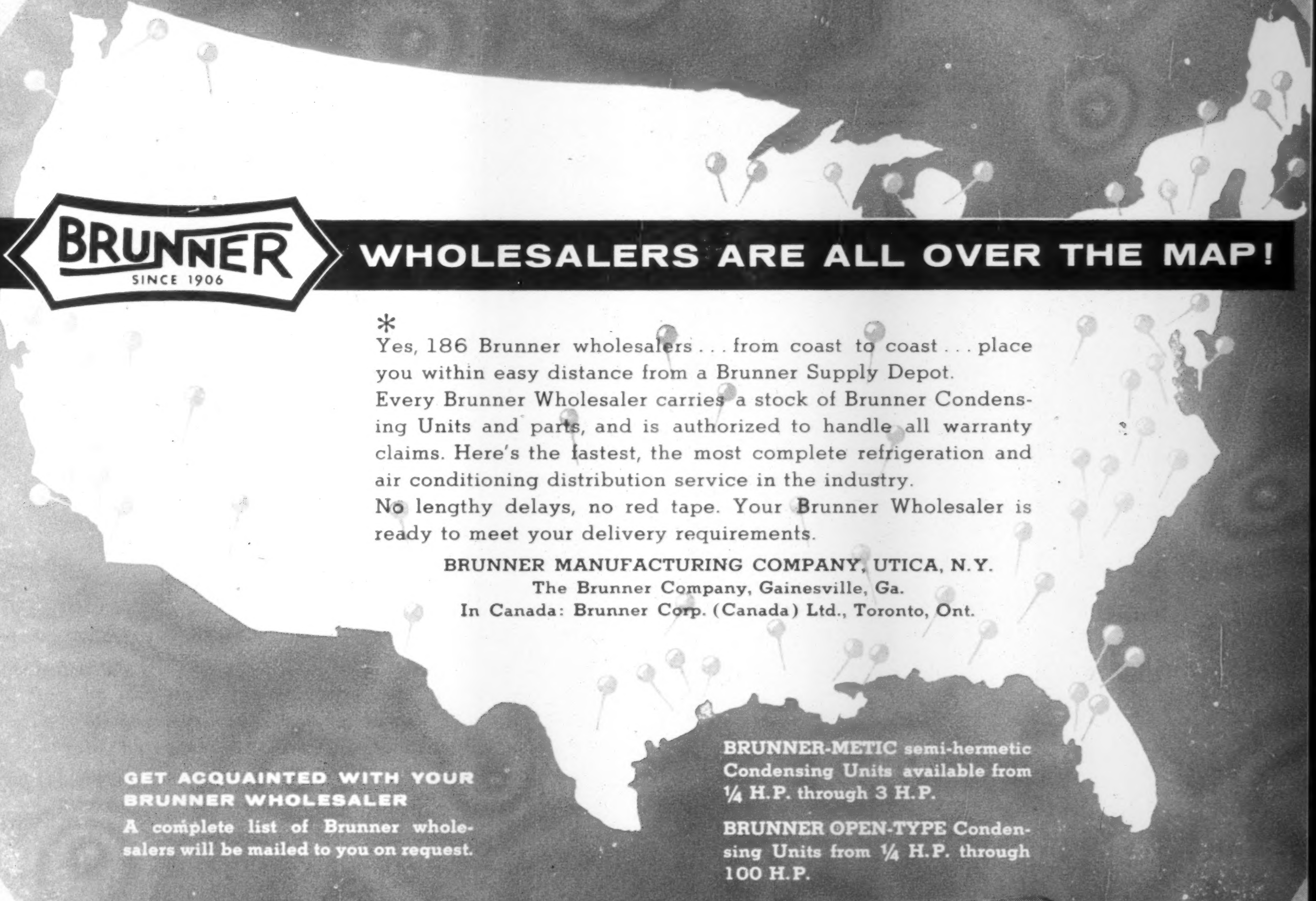
For industrial, commercial installations requiring central water supply for individual fan-coil air conditioners. "Model CWG-E" engineered to cover broad span of outgoing water temperatures, temperature drops, tonnage ranges. Condenser can be installed as component part or separately. In range of models, sizes 7½ to 75 hp.

Insulated Access Doors . . .

. . . for heating, air conditioning equipment—*Ventfabrics, Inc., Dept. HPAC, 640 N. Kedzie Ave., Chicago 12.*

Finished with neutral gray baked enamel. Doors are 24 gage metal, frames 18 gage metal. Door panels insulated with glass fiber, ½ in. thick, covered with

186*



BRUNNER SINCE 1906

WHOLESALERS ARE ALL OVER THE MAP!

*
Yes, 186 Brunner wholesalers . . . from coast to coast . . . place you within easy distance from a Brunner Supply Depot.

Every Brunner Wholesaler carries a stock of Brunner Condensing Units and parts, and is authorized to handle all warranty claims. Here's the fastest, the most complete refrigeration and air conditioning distribution service in the industry.

No lengthy delays, no red tape. Your Brunner Wholesaler is ready to meet your delivery requirements.

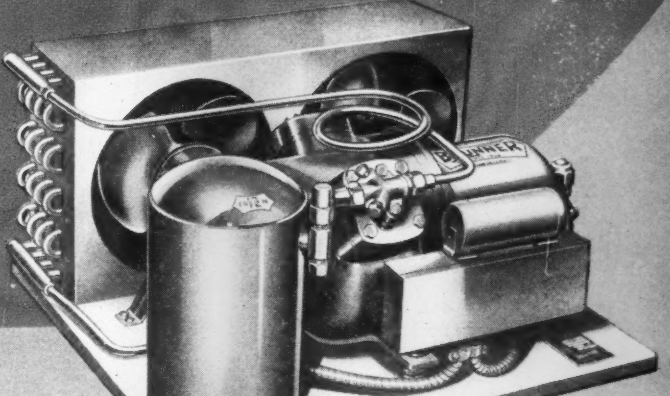
BRUNNER MANUFACTURING COMPANY, UTICA, N.Y.
The Brunner Company, Gainesville, Ga.
In Canada: Brunner Corp. (Canada) Ltd., Toronto, Ont.

GET ACQUAINTED WITH YOUR BRUNNER WHOLESALER

A complete list of Brunner wholesalers will be mailed to you on request.

BRUNNER-METIC semi-hermetic Condensing Units available from 1/4 H.P. through 3 H.P.

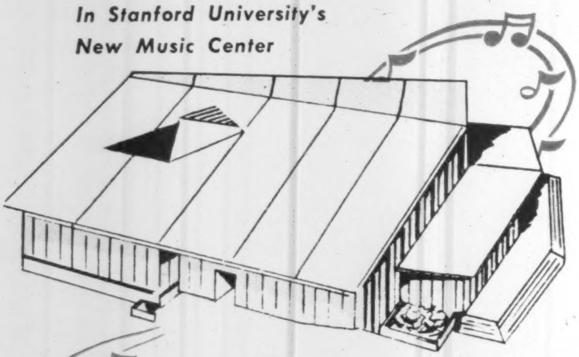
BRUNNER OPEN-TYPE Condensing Units from 1/4 H.P. through 100 H.P.



BRUNNER SINCE 1906

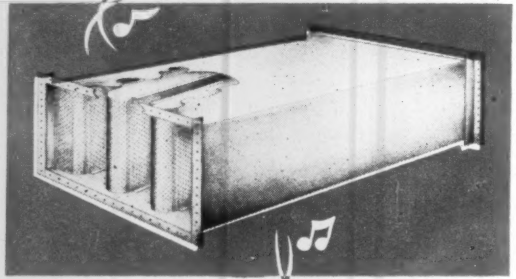
BRUNNERIZE FOR DEPENDABLE REFRIGERATION AND AIR CONDITIONING

In Stanford University's
New Music Center



Architects—Milton T. Pflueger, Eldridge T. Spencere &
William Clement Ambrose
Consulting Engineers—Buonaccorsi & Murray
Mechanical Contractor—James A. Nelson Company

only the music
shall be heard!



thanks to

IAC Your Standard of Silence

Quiet Duct

packaged standardized
silencing

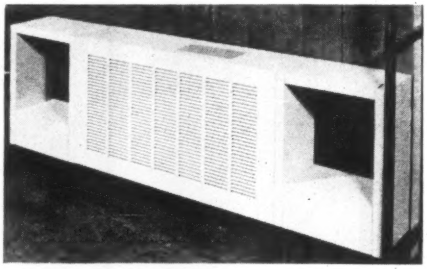
The air-conditioning and ventilating system of Stanford University's new Music Center was silenced *in the design stage* with *rated* IAC Quiet-DUCTS!

Pre-fabricated in as many as 148 sizes, these economical Quiet-DUCT units measuring in length from 2 to 10 feet, provide as much noise control as a conventional lined duct measuring from 30 to 100 feet long!

COMPLETE DATA AVAILABLE
Write today for a complete set of data sheets and catalog describing prefabricated "Quiet-DUCT" units.

Industrial Acoustics Company, Inc.
Specialists in Noise & Pulsation Control
341 Jackson Avenue, New York 54, N. Y. CYpress 2-0180

28 gage metal on air stream side. No parts project into air stream, says company, can be mounted near splitters or dampers without interfering with their operation. In three sizes: 12 × 10, 16 × 12, 24 × 16 in.



Air Conditioning Units . . .

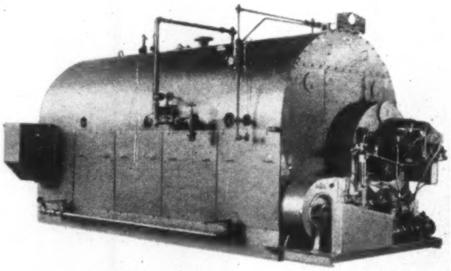
. . . with new design, engineering features—*Industrial Div., York Corp., Dept. HPAC, York, Pa.*

Line includes modular units with built-in bookshelves, foot high modular units, unit containing double coil which company claims is very efficient, high velocity model. Four are high velocity models, four are fan coil type. Three high velocity units are wall mounted and two of these employ modular construction with functional enclosures featuring bookshelves on either side and concealed service enclosures.

Heat Pump Air Conditioners . . .

. . . engineered to provide year 'round heating, cooling of commercial establishments—*York-Shipley, Inc., Dept. HPAC, York, Pa.*

To be available soon, says company, units will be incorporated with line of air cooled condensing units for remote installations and will be connected to evaporator section through new type precharged refrigerant lines.



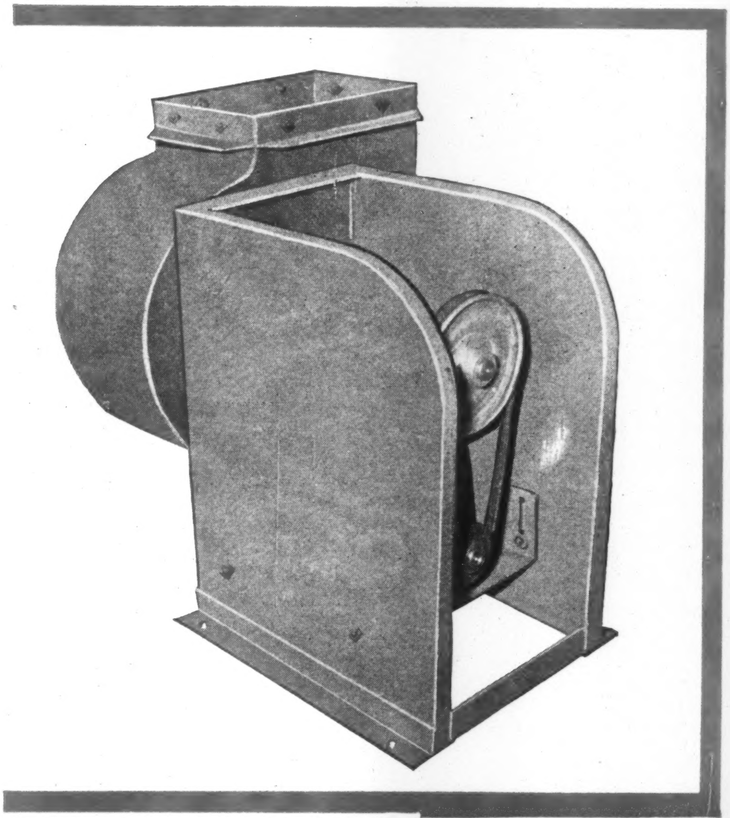
Package Boilers . . .

. . . available with choice of either forced draft or induced draft fans—*Dutton Boilers Div., Hapman-Dutton Co., Dept. HPAC, Kalamazoo, Mich.*

In sizes 20 to 500 hp. Cited feature is off-center, "five o'clock" firing tube, a modified Scotch marine design. Is said to create more positive water circula-

"We enjoyed the biggest and best year at the IH and AC Exposition!"

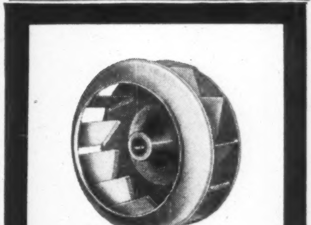
THANKS FOR STOPPING IN TO SEE OUR EXHIBIT



Our Utility Type Ventilating Fan won approval.

Catalog Bulletin No. 125 will be available soon.

Seven sizes are offered, from 13½" to 30" wheel diameter.



Backwardly curved blade wheel with non-overloading horse power characteristic.

MASSACHUSETTS BLOWER DIVISION
The **BISHOP & BABCOCK** *Mfg. Co.*
4901 HAMILTON AVENUE · CLEVELAND 14, OHIO

The MASSACHUSETTS *Line*

NOW a Modern Fittings Package

one more reason for specifying
W-S FORGED STEEL FITTINGS

W-S Forged Steel Fittings are now being shipped in strong, lightweight fiberboard cartons designed to make purchasing a pleasure. Shipments are made up of unit cartons packaged inside a larger reinforced carton. It's easy...and advantageous to order your fittings in packaged quantities.

Here are additional advantages of the new W-S package:

1. Compact and easy to handle.
2. Ideal for neat, efficient stacking on warehouse and stockroom shelves.
3. Sealed against dust and moisture.
4. Contents clearly marked on outside face of each carton, readily visible for prompt identification.

The new W-S package is only one of many reasons why W-S Forged Steel Fittings are the most widely accepted by industry.

Don't forget, too, W-S carbon steel fittings have the additional protection of their new blue synthetic coating. For detailed information on packaged lots ...and for a copy of our new fittings catalog, write today to W-S Fittings Division, H. K. Porter Company, Inc., Roselle, N. J.

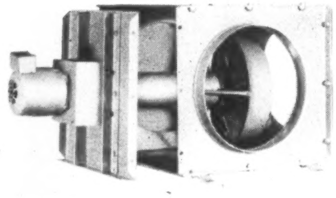
Sold Through Leading Distributors

HKP W-S FITTINGS DIVISION
H. K. PORTER COMPANY, INC.

EQUIPMENT DEVELOPMENTS

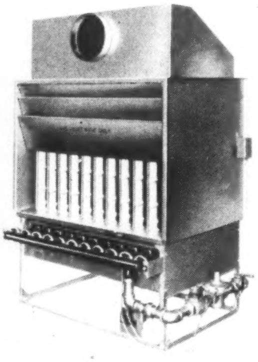
Continued

tion in rotary motion, increase safety with higher column of water over hot furnace, eliminate surging and priming.



Draft Inducers . . .
. . . for smaller buildings—*L. J. Wing Mfg. Co., Dept. HPAC, Linden, N.J.*

"10-D" designed for small commercial heating plants, with capacities to 4½ gal of oil or 500 cu ft of 1000 Btu per hr gas. Cited feature of unit is that motor and fan assembly are one unit, easily withdrawn from casing for inspection or servicing, says company.



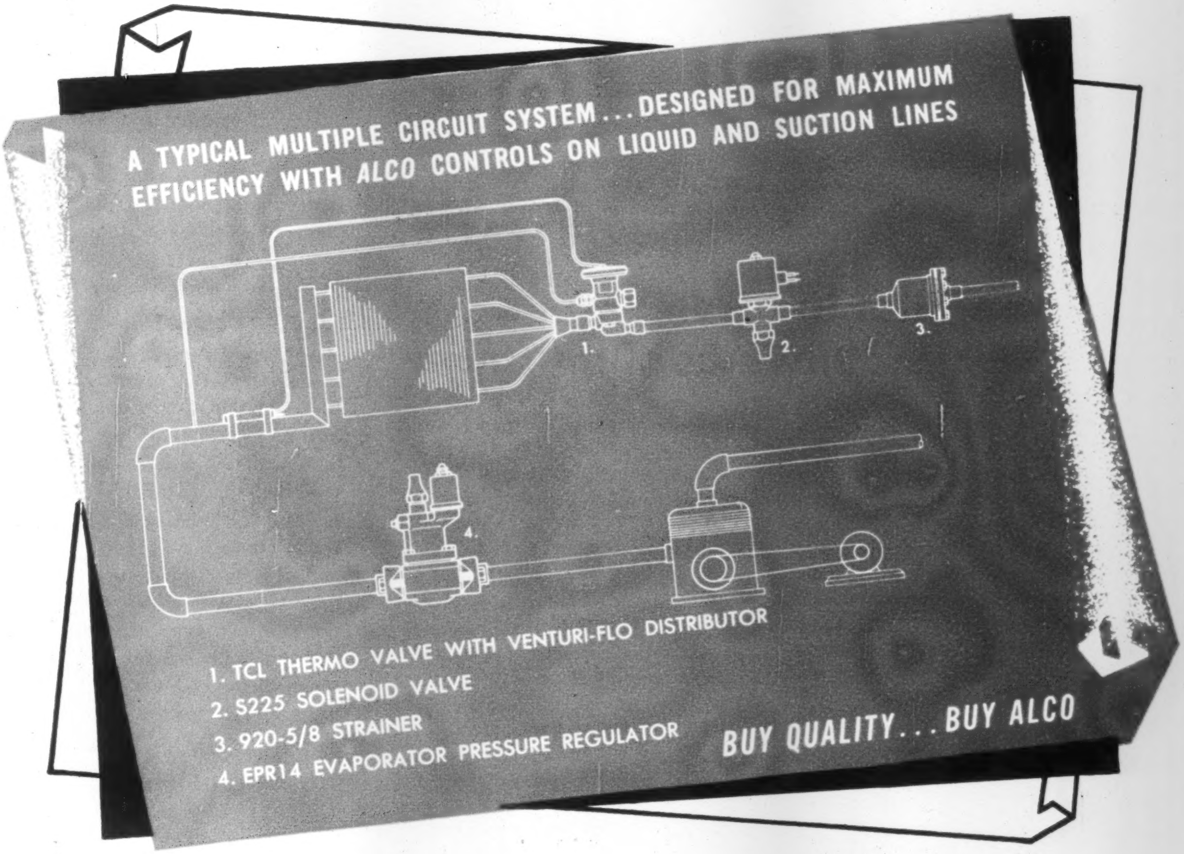
Aluminized Duct Furnace . .
. . . for small commercial, industrial applications—*Payne Co., Dept. HPAC, 700 Royal Oaks Dr., Monrovia, Calif.*

In four basic sizes: 200,000, 280,000, 360,000, 440,000 Btu input. For natural gas. Featuring aluminized heat exchanger, exchanger material is said to have high resistance to corrosion. AGA approved for as low as 50 deg temperature rise through furnace, can be used in combinations for up to 1,760,000 Btu per hr input, says company.

ALCO MAKES

every fluid control you need

...for any refrigeration system



A TYPICAL MULTIPLE CIRCUIT SYSTEM... DESIGNED FOR MAXIMUM EFFICIENCY WITH *ALCO* CONTROLS ON LIQUID AND SUCTION LINES

1. TCL THERMO VALVE WITH VENTURI-FLO DISTRIBUTOR
2. S225 SOLENOID VALVE
3. 920-5/8 STRAINER
4. EPR14 EVAPORATOR PRESSURE REGULATOR

BUY QUALITY... BUY ALCO

The one complete line of refrigerant controls: Thermostatic Expansion Valves, Refrigerant Distributors, Solenoid Valves, Suction Line Regulators, Flooded Evaporator Controls and Reversing Valves

SEE YOUR ALCO WHOLESALER

ALCO

ALCO VALVE CO.
861 KINGSLAND AVE. • ST. LOUIS 5, MO.

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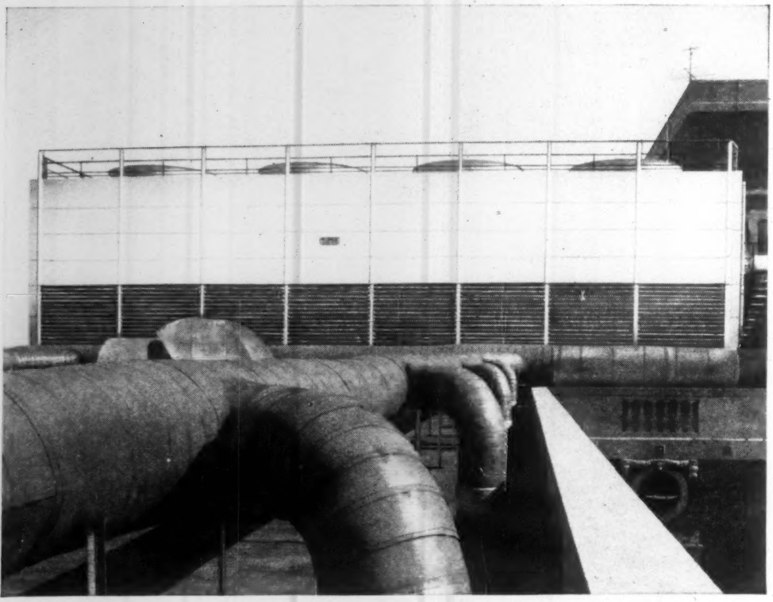


This Binks cooling tower, atop the Palmer House, is the heart of a newly augmented air conditioning system for 1735 guest rooms, dining and shopping facilities.

at the Palmer House in Chicago...

air conditioning water costs cut 96% by Binks cooling tower

"Our Binks cooling tower has done a great job for us," reports Chief Engineer John F. Edelhofer of the Palmer House Hotel. "Since June of 1956 our records show air conditioning water costs are only 4% of what they would have been under our old 'one-pass' system. In terms of volume, we are saving almost 7700 gallons per minute of operation. The tower should pay for itself in five years."

Cooling tower features

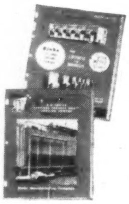
This tower is one of Binks 2-K vertical induced draft series. It cools and recirculates 8000 gallons per minute. Water enters at 95°F and leaves at 85°F. Four 12' diameter aluminum alloy fans assure scientifically balanced air-to-water ratio for high cooling efficiency under all climatic conditions. All panels and framework in the 72' by 42' tower are heavily galvanized and coated to insure minimum maintenance.

A complete line

Whether it is for air conditioning or the cooling of manufacturing process fluids, there is a Binks cooling tower of the correct capacity and type for every job.

Send for complete data

Ask your Binks branch office for a copy of Bulletin 333 and Bulletin 477-A or write direct to the address below. Binks engineers will be glad to answer your questions and help you solve your cooling problems. There's no obligation.



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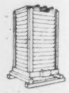
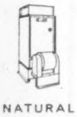
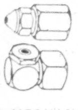
Binks
EVERYTHING FOR WATER COOLING



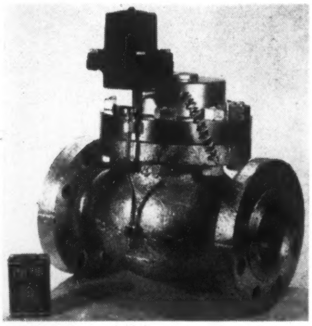




A COMPLETE LINE OF NATURAL DRAFT AND MECHANICAL DRAFT COOLING TOWERS AND INDUSTRIAL SPRAY NOZZLES

Binks Manufacturing Company
3118-38 Carroll Ave., Chicago 12, Ill.

REPRESENTATIVES IN PRINCIPAL U.S. & CANADIAN CITIES • SEE YOUR CLASSIFIED ☎ DIRECTORY



Solenoid Valves . . .

. . . for liquids to 600 psi—*J. D. Gould Co., Dept. HPAC, 4707 Massachusetts Ave., Indianapolis 18.*

Cast steel units available in sizes 2, 2½, 3, 4 in. Can be either globe or angle pattern with screwed or flanged pipe ends. Cited features include renewable seat rings, unbreakable piston rings, packless operation over wide pressure range.

Booster Pump . . .

. . . designed for in-the-line installation in circulating water systems requiring additional pressure head without additional pumping capacity—*Bell & Gossett Co., Dept. HPAC, Morton Grove, Ill.*

Recommended by company for chilled water systems or combination heating and cooling systems where there is considerable pressure drop through water chiller, condenser or series of fan-coil units. Includes 1/6 hp, 1750 rpm motor.

Air Conditioners . . .

. . . for stores, offices, restaurants, shops, general commercial use—*Fresh'nd-Aire Co., Div. of Cory Corp., Dept. HPAC, 3200 W. Peterson Ave., Chicago 45.*

In two separate series of water cooled units in 2, 3, 5 hp sizes. Units feature "Stack'n Cool" design, exclusive "Clean-o-Matic" filter signal, said company.

Fuel Oil Additive . . .

. . . formulated to prevent sludge, gummy residue from forming in storage tanks—*E. I. du Pont de*

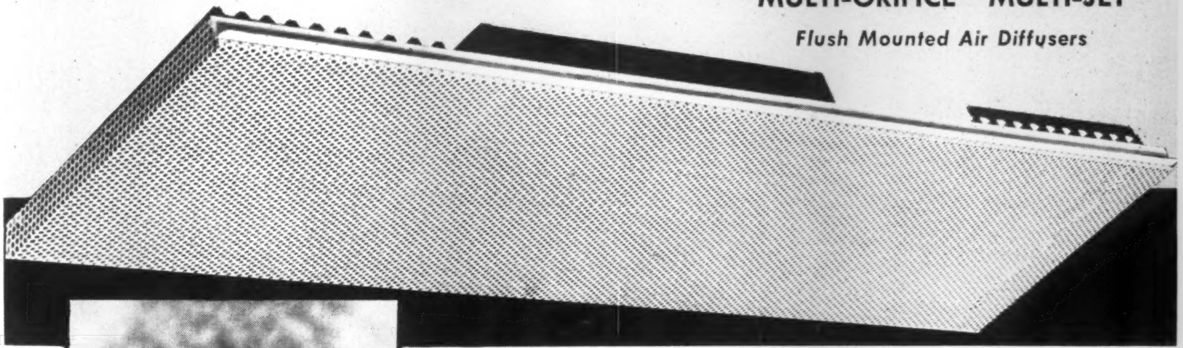
Now

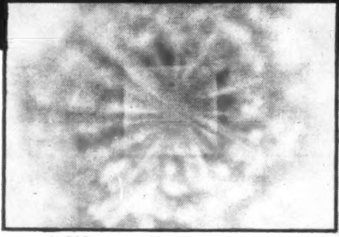
A-F AIR-FACTORS INC

MO-MJ

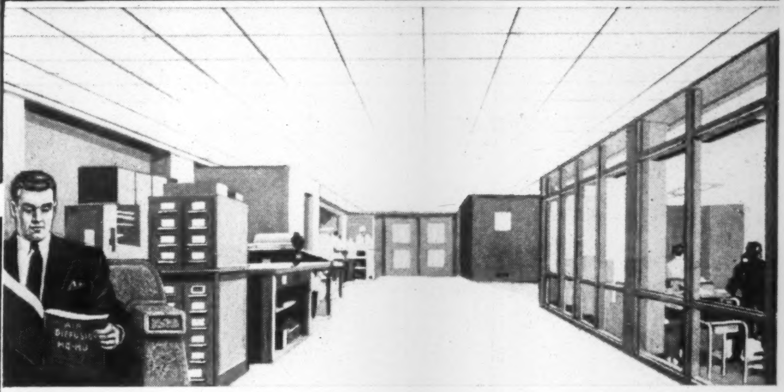
MULTI-ORIFICE MULTI-JET

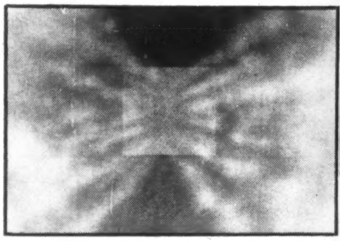
Flush Mounted Air Diffusers



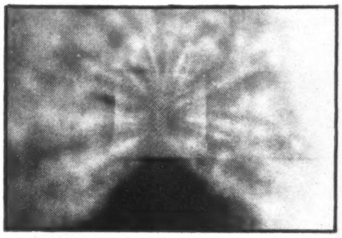


4 Way Diffusion Pattern





2 Way Diffusion Pattern



3 Way Diffusion Pattern

1 Way Diffusion Pattern

ARCHITECTURALLY ADAPTABLE WITHOUT SACRIFICING MECHANICAL REQUIREMENTS

Multi-Orifice, Multi-Jet Air Diffusers have been designed to comply with modern architectural concepts and still provide all of the tried and proven elements of the Air-Factors popular B60 Air Diffuser.

Custom engineered air conditioning systems may be designed with full proportionate air patterns available.

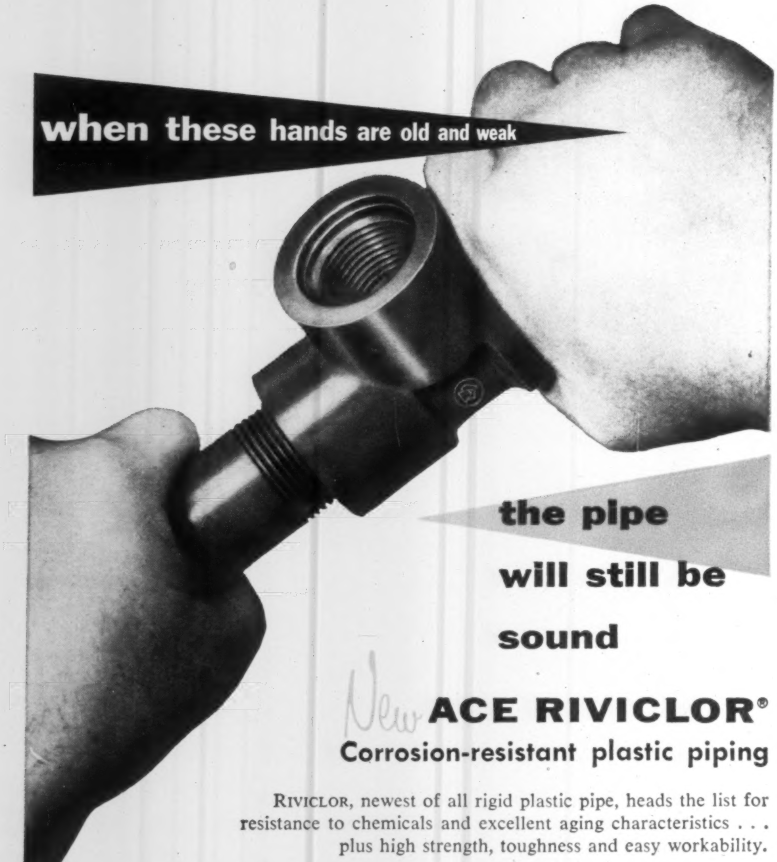
Supply air is discharged into a room substantially paralleling the surface upon which the air diffuser is mounted to produce the maximum in air mixing properties and afford proper circulation for human comfort.

Write for Literature and Engineering Data

A-F AIR-FACTORS INC

1624 South Raymond Ave.
Monrovia, California

AIR-FACTORS — MANUFACTURERS OF THE MOST COMPLETE LINE OF AIR DISTRIBUTION EQUIPMENT


when these hands are old and weak
the pipe will still be sound

New **ACE RIVICLOR®**

Corrosion-resistant plastic piping

RIVICLOR, newest of all rigid plastic pipe, heads the list for resistance to chemicals and excellent aging characteristics . . . plus high strength, toughness and easy workability.

Riviclor is unplasticized polyvinyl chloride, specially formulated for process piping. Non-toxic, non-flammable, excellent insulating properties. Only half weight of aluminum. Never needs painting. Smooth inner surfaces give you high flow rates with low loss of head.

Use Riviclor for all in-plant piping of mild or strong corrosives at normal temperatures . . . for liquid lines where "sweating" or corrosive vapors are problems . . . for underground piping. Pipe, fittings, diaphragm valves from ½" to 2".

Ask for Technical Bulletin CE-56.

Approved For Use With Drinking Water

nSf NATIONAL SANITATION FOUNDATION TESTING LABORATORY

ABBREVIATED TABLE OF CHEMICAL RESISTANCE

ACIDS		BASES		MISCELLANEOUS			
Acetic 50%	S	Ammonium Hydroxide 28%	S	Ethyl Alcohol	S	Carbon Tetrachloride	S
Chromic 25%	S	Sodium Hydroxide 50%	S	Methyl Ethyl Ketone	U	Plating Solutions	S
Hydrochloric 38%	S	HALOGENS		Gasoline	S	Photographic Solutions	S
Hydrofluoric 50%	L	Sodium Chloride Sat.	S	Mineral Oil	S	KEY: S—Satisfactory	
Nitric 20%	S	Ferric Chloride	S	Animal Oil	S	L—Limited to certain applications	
Sulphuric 50%	S	Sodium Hypochlorite 5%	S	Vegetable Oil	S	U—Unsuitable	
Sulphuric 98%	S			Phenol 10%	S		
				Chlorine 5%	L		
				Alum	S		

ACE processing equipment of rubber and plastics

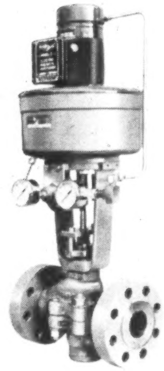
AMERICAN HARD RUBBER COMPANY
93 WORTH STREET • NEW YORK 13, N. Y.

EQUIPMENT DEVELOPMENTS

Continued

Nemours & Co., Petroleum Chemicals Div., Dept. HPAC, Wilmington, Del.

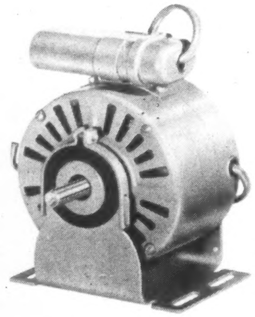
Is said to keep particles in fuel from clustering together, settling to bottom of tank. Prevents clogging of filters and burner nozzles, says company. When used in large enough quantities and recirculated through storage tank, is said to clean out sludge which may have accumulated.



Control Valves . . .

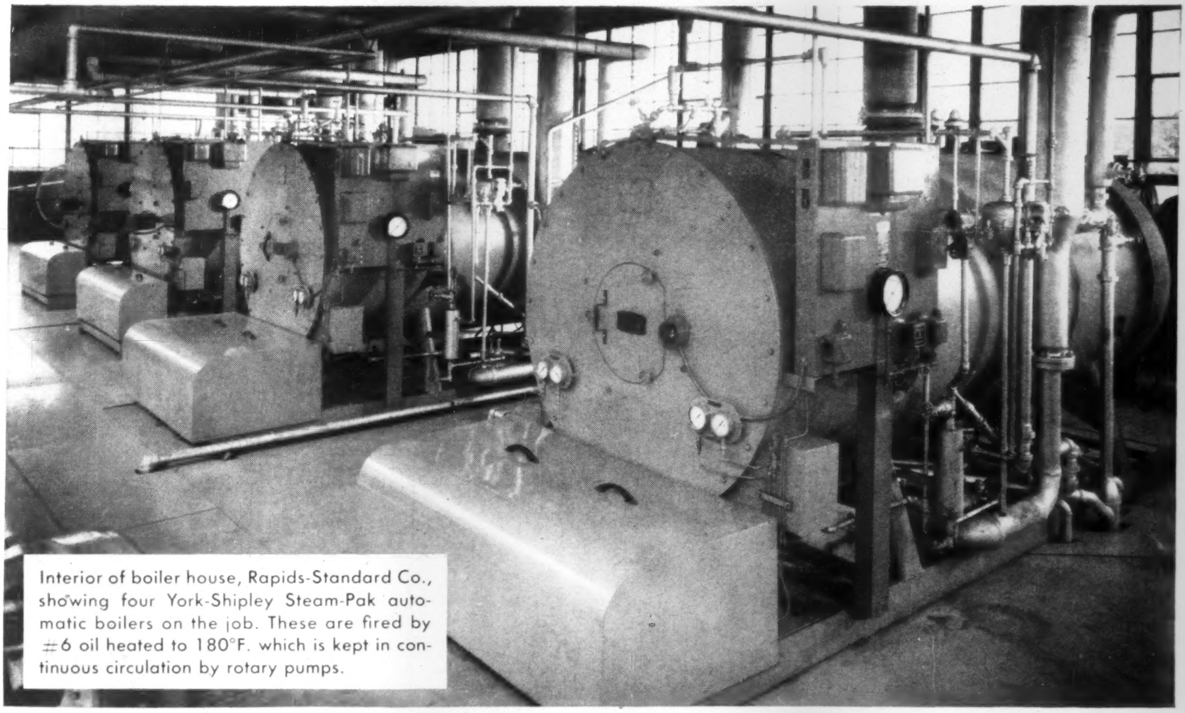
. . . with electro-pneumatic positioner available as integral component—*Conoflow Corp., Dept. HPAC, 2100 Arch St., Philadelphia 3.*

Positioner provides valve positioning which is directly proportional to d-c signals received from electronic instruments. No electro-pneumatic transducer is required; full 100 psi plant air supply can be used, says company.



Electric Motors . . .

. . . designed to meet more rigid requirements of space, amperage, pow-



Interior of boiler house, Rapids-Standard Co., showing four York-Shipley Steam-Pak automatic boilers on the job. These are fired by #6 oil heated to 180°F. which is kept in continuous circulation by rotary pumps.

They're saving money today . . . and looking after tomorrow, too !

How York-Power Steam-Paks more than doubled heating output . . . with no increase in building costs.

For more than eight years, two YORK-POWER Steam-Paks had been supplying ample heat for the Rapids-Standard Company in their Plymouth, Michigan plant.

The efficiency and economy records of these boilers were so high that when the time came to double plant facilities, company engineers realized they could do no better than to add two more Steam-Paks to take care of increased heating needs.

"From our particular view point," said Mr. Russell A. Inwood, Vice President of Engineering and Manufacturing, "the flexibility which YORK-POWER Steam-Paks provided for continuous expansion was of greatest importance. Also, because there were no expensive chimneys or foundations to construct, and because the units were pre-wired and pre-piped, we could cut down on installation costs."

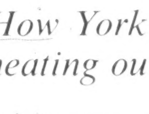
SAVED BUILDING COSTS. Merely by rearranging the floor plan of the over-size boiler house, it was found that two more Steam-Paks could be set up . . . with *no extra building costs.* These four units now take care of all present heating needs and also provide for continued expansion for many years to come.

Find out how YORK-POWER Steam-Paks can help you. Our engineers are available to give full cooperation. Specification sheets and detailed data are yours for the asking. Write TODAY.

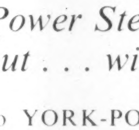
Industrial Division **YORK-SHIPLEY, Inc.** **YORK, PENNSYLVANIA**

ONLY YORK-POWER OFFERS A COMPLETE LINE OF AUTOMATIC BOILERS, BURNERS, AND FUEL BURNING SYSTEMS

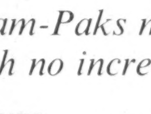
STEAM-PAK
15 to 600 Hp.
Oil and/or Gas Firing



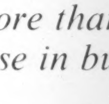
STEAM-PAKETTE
10 to 50 Hp.
Oil and/or Gas Firing



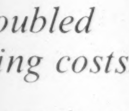
FIRE-PAK
35 to 485 Hp.
Oil and/or Gas Firing



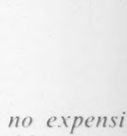
SCOT-PAK
52 to 400 Hp.
Oil and/or Gas Firing



ECONOL BURNER
5 to 28 G. P. H.
Oil Firing

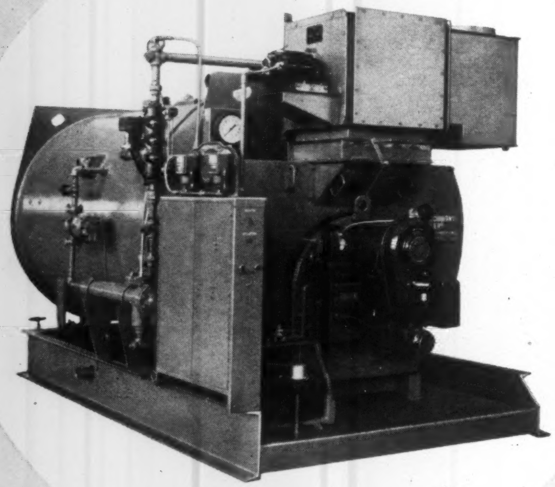


ROTARY BURNER
18 to 400 Hp.
Oil and/or Gas Firing



F/C SYSTEMS
Automatic Fuel
Burning Systems

Complete, Coordinated, Compact Construction



THE Fitzgibbons PACKAGED BOILER UNIT

For detailed information about this boiler — catalog sheets, brochures, and specifications — write today to the Fitzgibbons Boiler Company, address below.

Full wet back construction provides complete water jacketing of the entire rear combustion chamber. There are *no* refractory arches or walls to deteriorate and replace. Fitzgibbons has always pioneered this design.

Sizes up to 464 horsepower for oil or gas firing are available. *All* units are *factory tested* before shipment.

This is a complete unit — a "Scotch" type steel boiler with burner, fully automatic controls and safety devices, and the induced draft fan for cleaner, quieter operation at high efficiency without a stack.

Domestic hot water supply for any purpose is constantly and effectively furnished through the famous Fitzgibbons "Tanksaver"® — a finned, copper coil submerged in the boiler where the water is the hottest.

Select the unit backed by the name "FITZGIBBONS."

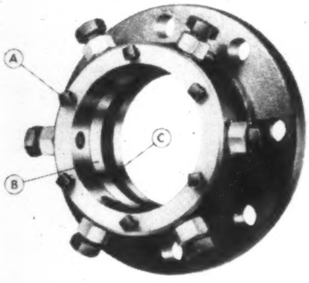
Fitzgibbons®
Boiler Company, Inc.
101 PARK AVENUE, NEW YORK 17, N. Y.
DEPT. 20

SINCE 1886 · MOST ECONOMICAL IN FUEL · 1886 · THE FITZGIBBONS BOILER

FB116

er factor—*Marco Industries, Inc., Dept. HPAC, Womelsdorf, Pa.*

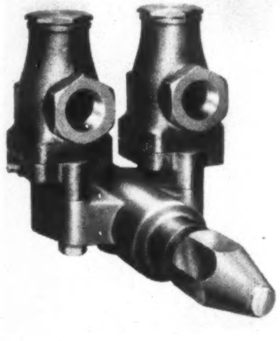
Small size, fractional horsepower, permanent split capacitor unit recommended by company for air conditioning, related air moving equipment. Can be installed in horizontal, vertical or inclined position. In ratings 1/150 to 1/5 hp.



Flange . . .

. . .engineered for "hundreds of applications"—*Pipe Line Development Co., Dept. HPAC, 5700 Detroit Ave., Cleveland 2.*

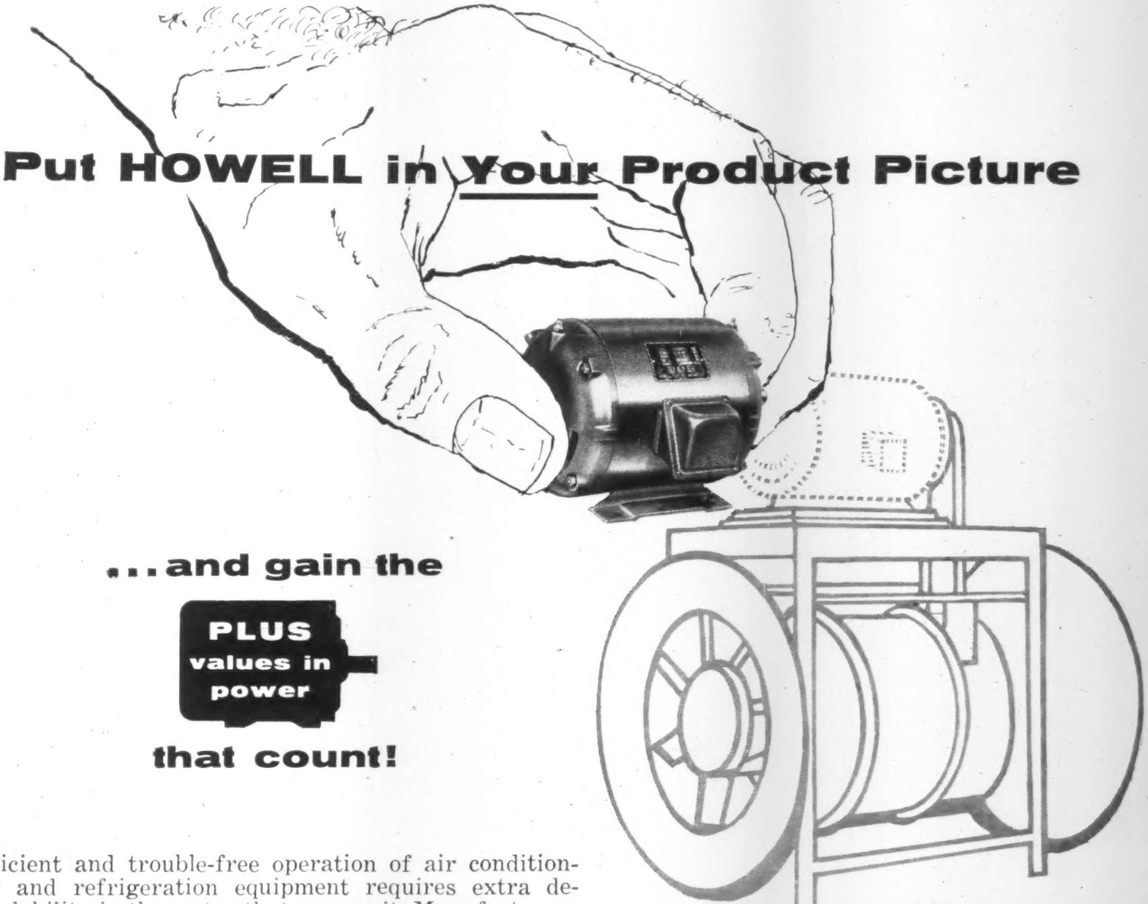
"Plidco-Flange" is of non-welded type, ready to install. When end thrust screws (A) are tightened, steel thrust ring (B) moves forward to squeeze packing ring (C) out between pipe walls. Result is said to be effective seal that withstands several hundred pounds per square inch pressure. Available in sizes 2 to 12 in. with 150 lb ASA standard steel flanges.



Safety Relief Valves . . .

. . .for industrial refrigeration, air conditioning installations—*York Corp., Dept. HPAC, York, Pa.*

Put HOWELL in Your Product Picture



. . . and gain the

PLUS values in power

that count!

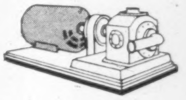
Efficient and trouble-free operation of air conditioning and refrigeration equipment requires extra dependability in the motor that powers it. Manufacturers and users throughout the industry recognize the plus values gained by specifying Howell motors, 1/8 thru 300 hp. Here are a few of these values:

Steel Feet and Frames Won't Crack Under Stress Unlike cast iron, Howell's steel feet won't crack when mounting bolts are tightened excessively. Howell's cold-rolled steel frames can take installation punishment. Cast iron end-plates assure constant shaft and bearing alignment.

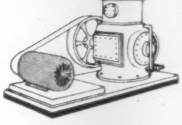
Cool-Running, Long-Lasting Efficiency New stator design with wide slots provides 50% more contact between cooling air and stator laminations. Combined with heat-dissipating copper rotors, this gives you a motor with extra stamina to withstand intermittent overloading or unusually high operating temperatures.

Functional Streamlining Howell motors have no fins, ribs or unnecessary offsets to collect dust deposits. External dirt cannot reduce these motors' cool-running efficiency — their neat appearance is easier to maintain.

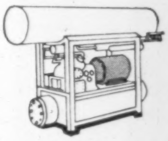
Wide Selection Howell makes virtually every type of AC industrial motor . . . fractional and integral to 300 hp, in all standard enclosures, in rerated and non-rerated frame sizes, and in many pump mountings. Howell part winding motors, for reduced voltage starting of compressors, pumps, etc., may be of special interest to you.



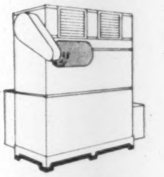
PUMPS



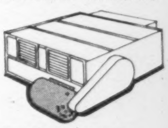
COMPRESSORS



PACKAGED CHILLERS



COOLING TOWERS



CENTRAL SYSTEM CONDITIONERS

Howell motors are used by these leading manufacturers of air conditioning equipment:

York Corp. ● Acme Industries ● Worthington Corp. ● Frick Corp. ● The Trane Co.

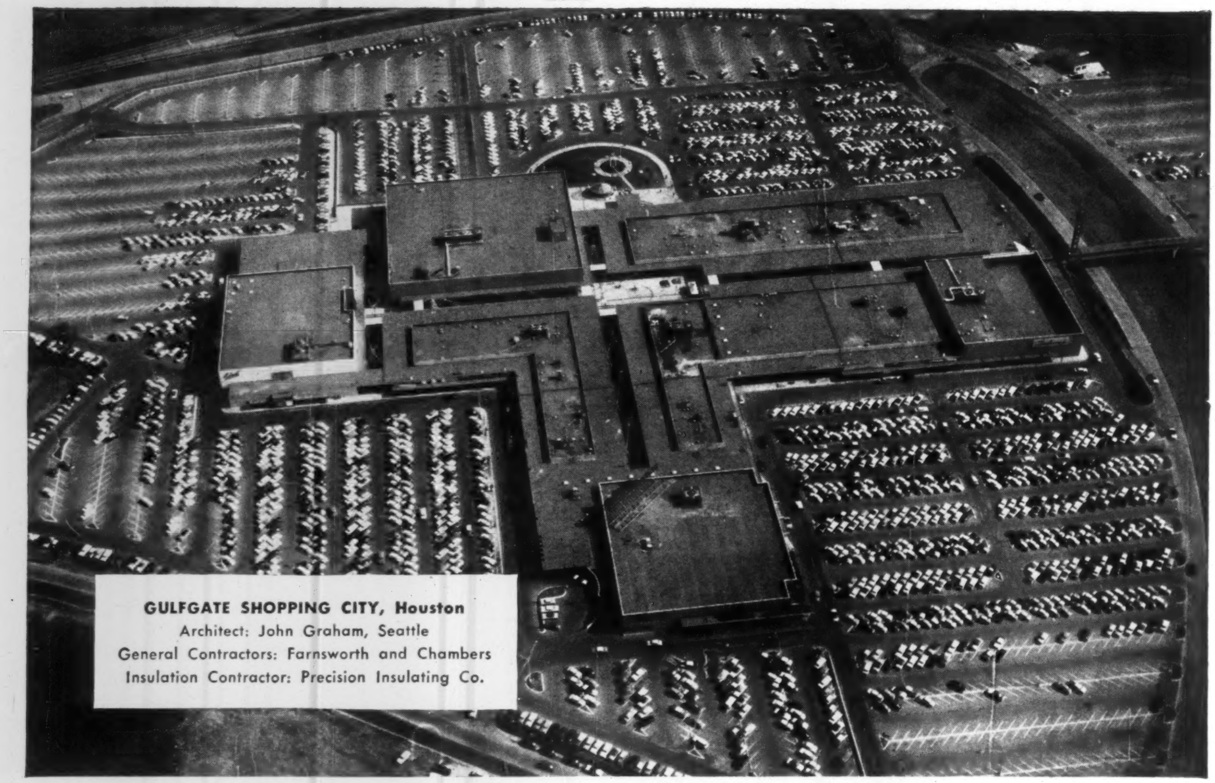
Binks Manufacturing Co. ● American Blower Corp.

A Howell sales engineer can give you valuable assistance on any motor application. Wire or 'phone collect . . . or drop us a line . . . you'll get prompt action. Howell Electric Motors Co., Howell, Michigan.

HOWELL Red Band MOTORS

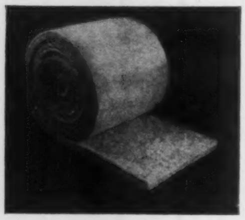
HOWELL *motors*

. . . precision built for industry since 1915



GULFGATE SHOPPING CITY, Houston
Architect: John Graham, Seattle
General Contractors: Farnsworth and Chambers
Insulation Contractor: Precision Insulating Co.

Whopping shopping center goes for GUSTIN gb BACON GLASS FIBER INSULATIONS...



. . . because G-B insulations are a step ahead in thermal and acoustical efficiency, in ease of application, and in lasting performance. At the world's largest shopping center — and in commercial, institutional and industrial construction everywhere — the first call is for these superior G-B products:

ULTRALITE DUCT LINER, the long glass fiber insulation specifically designed to silence objectionable noises in air conditioning systems — and an excellent thermal insulation in the bargain.

ULTRALITE DUCT INSULATION, the long glass fiber insulation that is superior in thermal efficiency . . . tougher and more resilient . . . easier and cheaper to apply.

G-B SNAP*ON, the popular one-piece pipe insulation molded of fine glass fibers. Snap*On is not only superior in thermal efficiency to *any* general-purpose pipe insulation on the market, but also far easier and cheaper to apply because 3-foot sections snap on the pipe in less time than it takes to say "Snap*On"!

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LOCAL G-B INSULATION DISTRIBUTOR LISTED IN ADJOINING COLUMN

GUSTIN-BACON *Manufacturing Company* GUSTIN gb BACON

Thermal and acoustical insulations • Molded glass fiber pipe insulation • Pipe couplings and fittings

220 W. 10th ST., KANSAS CITY, MO.

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(See ad on facing page)

ALBUQUERQUE, Mt. States Insulation Co.
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COLUMBUS, Santeler Brothers
DALLAS, Insulation Supply Co., Inc.
Payne-Ladewig, Inc.
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DENVER, Gene Wright Lumber Co.
DETROIT, Coon-DeVisser Co.
EL PASO, Insulation & Specialties Co.
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FT. SMITH, Ark., Gunn Distributing Co.
FT. WAYNE, Ind., M. H. Hilt, Inc.
FT. WORTH, The Bracken Co.
GREENSBORO, N. C., Starr Davis Co., Inc.
GULFPORT, Miss., Paine Supply Co.
HOUSTON, Precision Insulation Co
INDIANAPOLIS, Central Supply Co.
IRON MOUNTAIN, Mich., Champion, Inc.
JACKSON, Miss., Paine Refrigeration Supply Co.
JACKSONVILLE, Fla., Ferber Sheet Metal Works, Inc.
JOPLIN, Mo., Joplin Cement Co.
KANSAS CITY, Kelley Asbestos Co.
LITTLE ROCK, Gunn Distributing Co.
LOS ANGELES, Western Fibrous Glass Products
Thorpe Insulation Co.
LOUISVILLE, General Insulation & Roofing Co.
MADISON, Wis., J. D. Wilson Co.
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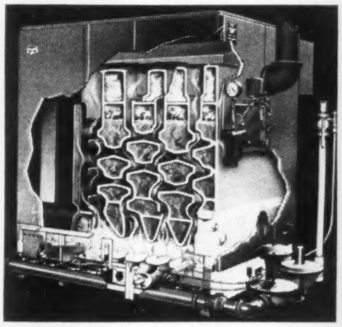
MOBILE, Ala., Shook & Fletcher
NASHVILLE, Southern States Iron Roofing Co.
NEWARK, N. J., Eastern Steam Specialty Co.
NEW HAVEN, Conn., Insulation Supply Co.
NEW ORLEANS, Eagle Asbestos & Packing
NEW YORK, Eastern Steam Specialty Co.
OKLAHOMA CITY, Ball Distributing & Engineering Co.
OMAHA, Cardinal Supply & Mfg. Co.
PHILADELPHIA, John F. Scanlan, Inc.
PITTSBURGH, Dravo Corp.
PHOENIX, Ariz., Kircher Asbestos & Rubber Co.
RALEIGH, N. C., Southern States Iron Roofing Co.
RICHMOND, Va., Southern States Iron Roofing Co.
ROCKFORD, Ill., Mott Brothers Co.
SALT LAKE CITY, Bullough Asbestos Supply Co.
SAN ANTONIO, The Bracken Co.
SAN DIEGO, Western Fibrous Glass Products
SAN FRANCISCO, Western Fibrous Glass Products
SAVANNAH, Ga., Southern States Iron Roofing Co.
SEATTLE, Western Fibrous Glass Products
ST. LOUIS, A. G. Brauer Supply Co.
ST. PAUL, Asbestos Products, Inc.
SYRACUSE, N. Y., Industrial Supply Co.
TAMPA, Fla., Eagle Roofing & Art Metal Works, Inc.
TALLAHASSEE, Fla., Capital Refrigeration & Supply
TULSA, Okla., Ball Distributing & Engr. Co.
TUPELO, Miss., Paine Supply Co.
WASHINGTON, Walter E. Campbell Co., Inc.
WICHITA, Jamar-Olmen Construction Co.
General Metals, Inc.
VANCOUVER, B. C., Fleck Brothers Limited

GUSTIN gb BACON

EQUIPMENT DEVELOPMENTS

Continued

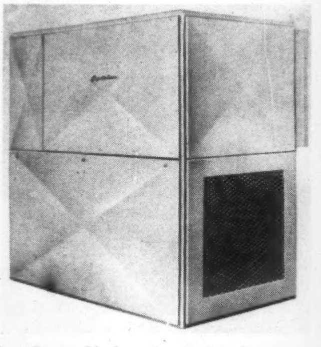
Available in standard pressure settings ranging from 50 psi in 25 lb increments. Dual assemblies assure operation of one valve while other is removed for tests or resetting, says company. Available in inlet sizes $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$ in.



Boilers . . .

. . . with added pressure relief valve feature—*Bryant Mfg. Co., Dept. HPAC, 2020 Montcalm, Indianapolis.*

Available as standard equipment on all boilers in company's line. Capacity of largest is 3,996,000 Btu per hr input. "Model 630" for use with natural, manufactured, mixed, LP gases.



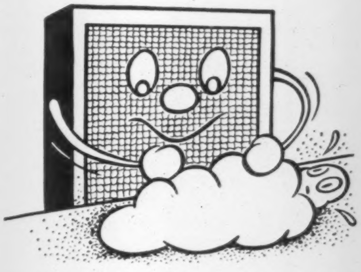
Air Conditioning Unit . . .

. . . with water cooled condenser, designed for industrial applications where remote installation is specified —*National-U.S. Radiator Corp., Heating and Air Conditioning Div., Dept. HPAC, Johnstown, Pa.*

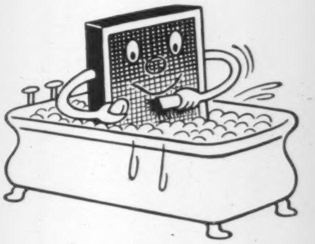
"Model SCR" is packaged unit requiring only power, ductwork, water supply connections, says company. In

AIR-MAZING FACTS

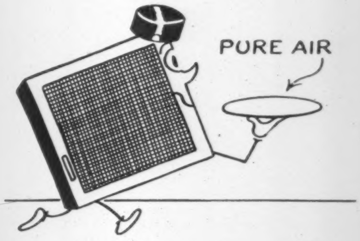
BY O. SOGLOW



REDUCING DIET FOR DIRT! City air is weighed down by tons of air-borne dirt. Tiny particles from rubber tires account for 40%, coal soot 30%, sand and grit 20%, live bacteria 10%. But the dirtiest air is no problem for Air-Maze filters.



NEW FILTER TAKES ITS OWN BATH! Automaze air filter curtain stays clean by continuously taking a bath. Special "pulse-action" in an oil bath thoroughly washes each panel automatically . . . renews adhesive. Operates 3 to 6 months without attention.



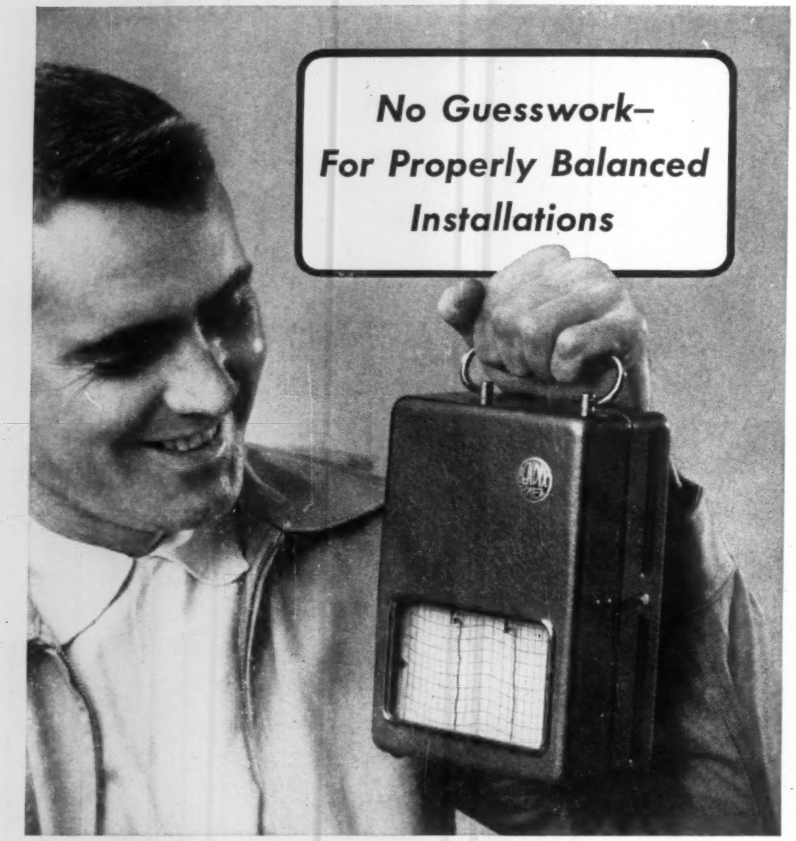
CALL FOR CLEAN AIR. Air-Maze panel filters keep hotels cleaner, guests happier with plenty of clean, fresh air. All-metal cells are easy to clean, provide high efficiency, low pressure drop. Ideal for hospitals, offices and stores.

FOR AIR CONDITIONING AND VENTILATING EQUIPMENT, ENGINES, COMPRESSORS *or any device using air or liquids*—there is an Air-Maze filter engineered to solve each filtering problem. For new all-line catalog, write Air-Maze Corporation, Dept. D-2, Cleveland 28, O.

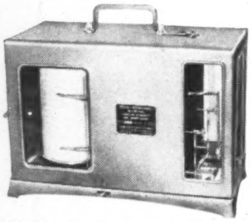
AIR-MAZE

The Filter Engineers

AIR FILTERS • SPARK ARRESTERS • LIQUID FILTERS
SILENCERS • OIL SEPARATORS • GREASE FILTERS



PORTABLE TEMPERATURE-HUMIDITY RECORDER HELPS YOU SELL, SERVICE AND INSTALL!


The Bendix-Friez Hygro-Thermograph (above), for more permanent installations, is a superior temperature and humidity monitor, built to U. S. Weather Bureau standards.

There's no need to gamble when you can be sure. The Bendix-Friez* Portable Temperature and Humidity Recorder has taken the gamble out of air conditioning and refrigeration installations. It gives you a permanent record of all temperature and humidity fluctuations on a single chart. You don't have to estimate the problem—you can *know* exactly what conditions you are dealing with before any installation is begun. In addition, it proves the operating efficiency of your equipment after it is installed.

The Portable Recorder is an excellent selling tool, too. Installed for a short period in a prospect's plant, it will provide information to help you explain just why your equipment is needed, as well as the precise type of equipment required for the job.

Completely automatic, the Recorder does not need wet bulbs, wicks or psychrometric tables and is built for 10-hour or 30-hour continuous operation. Write for our brochure "Bendix Tools for Heating, Refrigeration and Air Conditioning". Address 1494 Taylor Avenue, Baltimore 4, Maryland.

*REG. U.S. PAT. OFF.

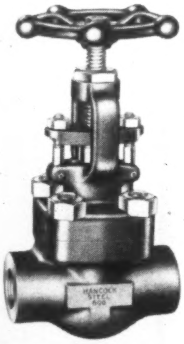
Friez Instrument Division

Bendix
AVIATION CORPORATION

EQUIPMENT DEVELOPMENTS

Continued

sizes 7½, 10, 15, 22½, 30, 40, 50, 60 hp in variety of arrangements. Accessory parts available include heating coils, flat type or "V" type filter sections, vibration rails, capacity controls.



Bolted Bonnet Valve . . .

. . . with integral or renewable seats —*Manning, Maxwell & Moore, Inc., Dept. HPAC, Stratford, Conn.*

Steel units available in globe, angle, check, flow control, high pressure drop designs. Units feature "OS & Y" bonnet with "Flexitallic" gasketed joints and stainless steel swing bolts, nuts, thread bushings and packing gland followers. Sizes range ¼ to 2 in.

Magnetic Device . . .

. . . engineered to prevent scale, corrosion in piping and industrial equipment—*Cepi-American, Inc., Dept. HPAC,* 7001 *North Ave., Oak Park, Ill.*

Device passes water, other fluids through concentrated magnetic fields. This causes salts which form scale to lose their ability to adhere as scale to piping and processing equipment, says company. In sizes 2 to 17,600 gpm.

Electronic Air Cleaners . . .

. . . for small commercial establishments—*Trion, Inc., Dept. HPAC,* 1000 *Island Ave., McKees Rocks, Pa.*

In eight models ranging in capacity 1000 to 9600 cfm of air. Designed to fit furnaces ranging to

*FIRST LINE *Extended-Surface* HEAT EXCHANGERS

ASK THE AEROFIN MAN

Specify Aerofin and you specify high efficiency, long service life and low maintenance and service costs.

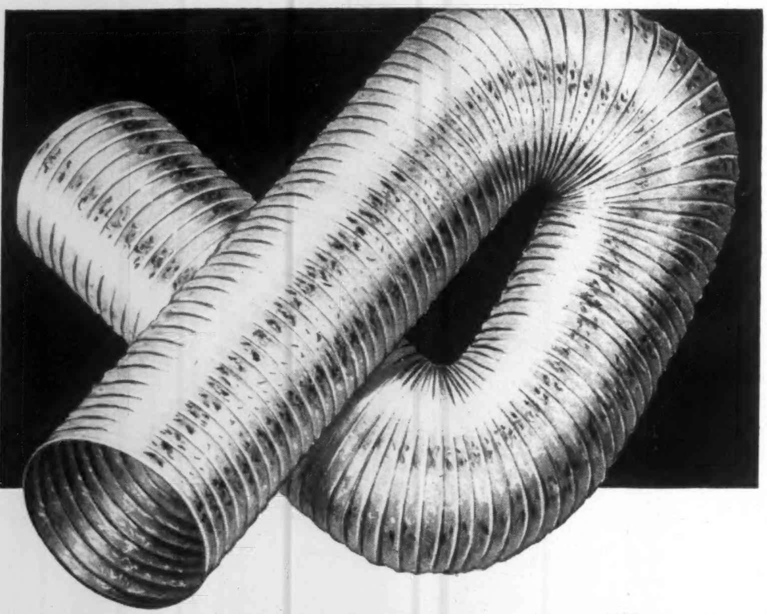
Take advantage of Aerofin's unequalled experience, production facilities, and materials-testing and design research—of Aerofin's complete engineering service at the plant and in the field.

Ask the Aerofin man.

* Aerofin makes extended heat surface exclusively — not as a by-product, not as a side-line. Sold only by manufacturers of fan-system apparatus. List on request.

AEROFIN CORPORATION

101 Greenway Ave., Syracuse 3, N. Y.



facts about Thermaflex®

that will help you solve your ducting problems

What is Thermaflex?
A lightweight, flexible ducting made of a spring steel wire helix covered with a three-ply reinforced laminate of woven fiber glass and metallic sheeting.

What are its applications?
Thermaflex is designed to supply air at temperatures ranging from 0°F. to 250°F. It is mainly used as a connector between main lines and diffusers or sound boxes in heating and air-conditioning systems.

What about installation?
It installs faster than rigid ducting at savings up to 32%. One man can do the job without special tools or fittings in just a few minutes.

Is it flame resistant?
Thermaflex will stand 1200°F.* without any sign of combustion or melting. The covering used in its construction is approved by Underwriters' Laboratories, Inc.

What pressures will Thermaflex handle?
25 psi, which is 5 times the minimum standards of the New York Board of Standards and Appeals.

How long will it last in service?
Much longer than rigid metal ducting. It is impervious to moisture, rust, rot, fungus and mildew.

How flexible is Thermaflex?
It takes tight bends with a radius equal to half its own diameter with practically no decrease in cross-sectional area.

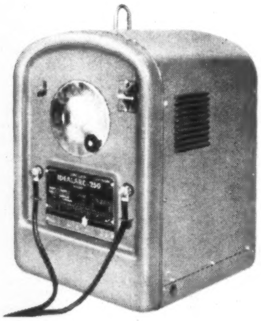
How is Thermaflex sold?
In a wide variety of diameters in standard 12-foot lengths that can be easily spliced or cut for long or short runs.

How can I make sure that Thermaflex will solve my problems?
Write us, outlining your requirements. Our engineers will be glad to put their experience to work for you. Write Dept. 74.

**As approved by the New York Board of Standards and Appeals.*

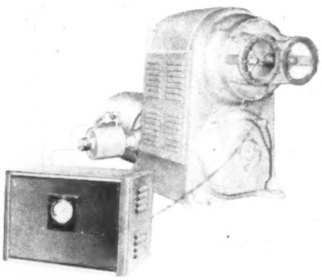
Flexible Tubing
CORPORATION
GUILFORD, CONNECTICUT • LOS ANGELES 64, CALIFORNIA

960,000 Btu. central air cooling units ranging 3 to 25 tons. Installed in return air duct of cooling or heating system.



Welders . . .
. . . in two new models added to company's line—*Lincoln Electric Co., Dept. HPAC, 22801 St. Clair Ave., Cleveland 17.*

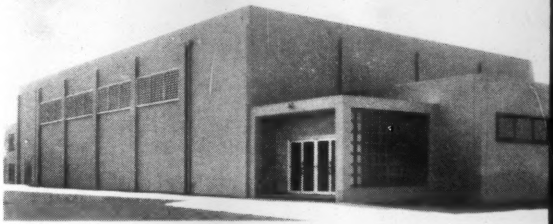
Combination a-c/d-c "Idealarc" units have 180 and 250 ampere capacities. Designed to meet needs of sheet metal shops, light production welding, maintenance welding in industry. Engineered to operate equally well as a-c transformer type or d-c rectifier type. Switch on front panel changes unit from a-c to d-c positive or d-c negative.



Variable Speed Drive . . .
. . . said to be capable of maintaining any speed in its range within 0.25 percent accuracy regardless of load fluctuations—*U. S. Electrical Motors, Inc., Dept. HPAC, Box 2058 Terminal Annex, Los Angeles 54.*

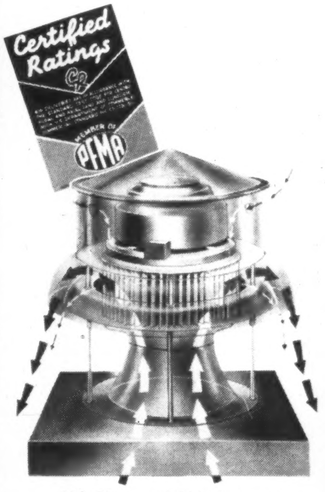
Recommended by company for industrial applications requiring exact speed regulation. Packaged system consists of "Varidrive" variable

Edward Markham Junior High Gymnasium
San Jose, California



Gallaher Air Vans®
are unanimous choice for Ventilation of $750,000 school gymnasium

Kress, Goudie and Kress, Architects, A.I.A.
G. M. Richards, Consulting Mechanical Engineer
A. J. Peters & Son, Mechanical Contractors



150 CFM to 65,000 CFM—up to 4" S.P. Certified Ratings.

"We felt they are superior to other makes of air exhausters now on the market," said M. J. March, mechanical engineer for G. M. Richards, Consulting M.E. of San Francisco, the engineering firm who designed the mechanical work on the project. Their past experience with Gallaher Air-Vans in construction of other school buildings led to this specification.

In addition to the Markham School Gymnasium building, the main school and the adjacent Willow Glenn High School have fifteen older Gallaher Air-Vans which have been in constant use for ten years.

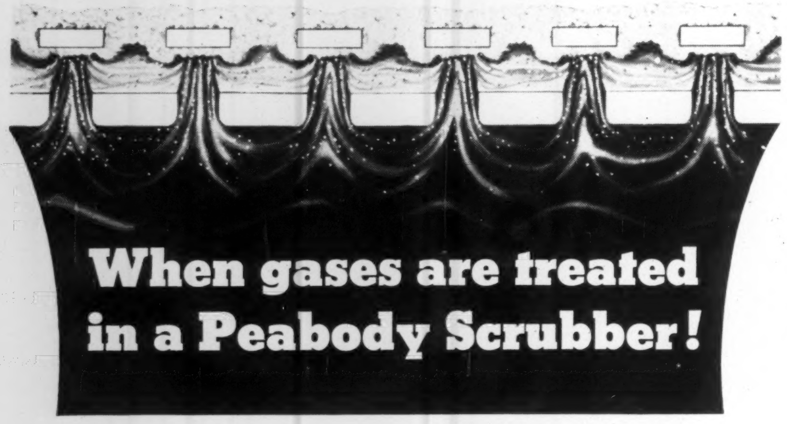
Engineers and Architects specify Gallaher Air-Vans for many features—patented scroll effect design, patented air seal-off, low silhouette, low noise levels, availability in special metals, weatherproof design, heavy construction and shipped completely assembled.

For full information on Air-Vans write to —

THE GALLAHER COMPANY
4108 Dodge Street Omaha, Nebraska

Export Office: 306 Paul Bldg., Utica, N. Y.

A Clear Sky from a Polluted Stack



When gases are treated in a Peabody Scrubber!

- Objective
  CLEAN • COOL • ABSORB
  simultaneously by means of the
  PEABODY
  Multi-orifice Impingement Baffle Plate
- Design
  Thousands of gas orifices
  An impingement baffle over each orifice
  A controlled blanket of liquid
- Operation
  Suspended matter trapped
  Heat transferred
  Solubles absorbed
- Result
  Clean, dry, cool gas!

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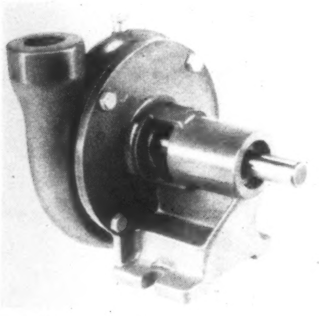
PEABODY LIMITED • LONDON, S.W. 1, ENGLAND

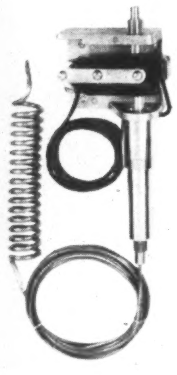
7-051

speed motor and "Speed Sensitive Varitrol" automatic control package. Available in sizes 1 to 60 hp.



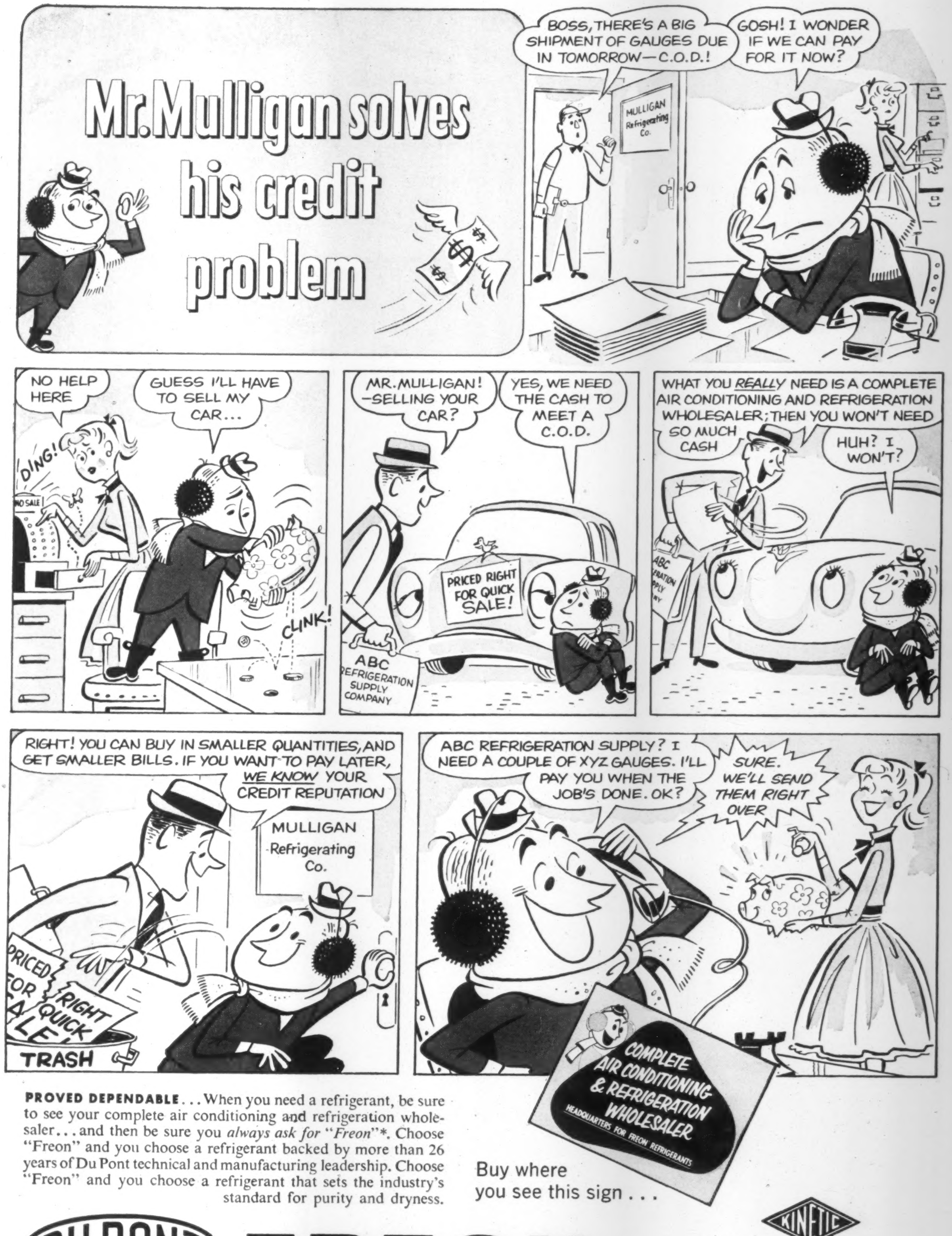
Centrifugal Pump . . .
. . .engineered for increased life, minimum maintenance—*E. L. Price Pump Co., Dept. HPAC, Sonoma, Calif.*

No grease fittings or packing gland to service after installation, said company. Cited features include: double ball bearings, mechanical shaft seals, heavy duty construction, "lifetime" lubrication.



Temperature Control . . .
. . .for wide range of uses—*United Electric Controls Co., Dept. HPAC 85 School St., Watertown 72, Mass*

Remote bulb control is uncalibrated, skeleton type unit for applications where space or weight is limiting factor. Models of "Type F56" available with range span of 250 F deg between limits of −150 and 150 F or 70 and 370 F, or with span of 500 F between limits of 100 and 650 F.


Mr. Mulligan solves his credit problem
BOSS, THERE'S A BIG SHIPMENT OF GAUGES DUE IN TOMORROW—C.O.D.!
GOSH! I WONDER IF WE CAN PAY FOR IT NOW?
MULLIGAN Refrigerating Co.
NO HELP HERE
GUESS I'LL HAVE TO SELL MY CAR...
DING!
NO SALE
CLINK!
MR. MULLIGAN! —SELLING YOUR CAR?
YES, WE NEED THE CASH TO MEET A C.O.D.
PRICED RIGHT FOR QUICK SALE!
ABC REFRIGERATION SUPPLY COMPANY
WHAT YOU REALLY NEED IS A COMPLETE AIR CONDITIONING AND REFRIGERATION WHOLESALER; THEN YOU WON'T NEED SO MUCH CASH
HUH? I WON'T?
RIGHT! YOU CAN BUY IN SMALLER QUANTITIES, AND GET SMALLER BILLS. IF YOU WANT TO PAY LATER, WE KNOW YOUR CREDIT REPUTATION
MULLIGAN Refrigerating Co.
PRICED RIGHT FOR QUICK SALE!
TRASH
ABC REFRIGERATION SUPPLY? I NEED A COUPLE OF XYZ GAUGES. I'LL PAY YOU WHEN THE JOB'S DONE. OK?
SURE. WE'LL SEND THEM RIGHT OVER
COMPLETE AIR CONDITIONING & REFRIGERATION WHOLESALER
HEADQUARTERS FOR FREON REFRIGERANTS

PROVED DEPENDABLE... When you need a refrigerant, be sure to see your complete air conditioning and refrigeration wholesaler... and then be sure you *always ask for "Freon"**. Choose "Freon" and you choose a refrigerant backed by more than 26 years of Du Pont technical and manufacturing leadership. Choose "Freon" and you choose a refrigerant that sets the industry's standard for purity and dryness.

Buy where you see this sign . . .

KINETIC
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FREON REFRIGERANTS

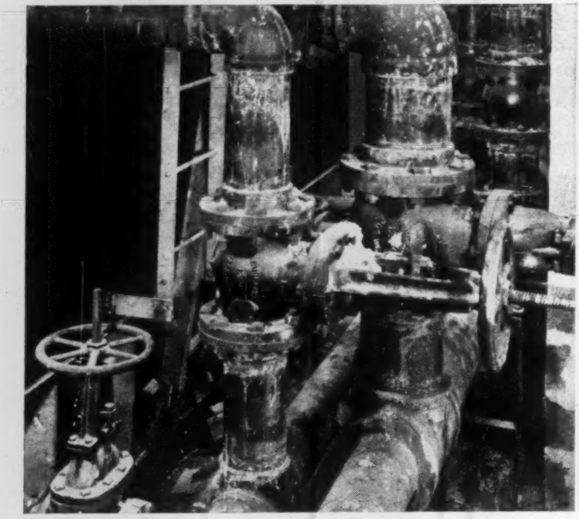
BETTER THINGS FOR BETTER LIVING... THROUGH CHEMISTRY

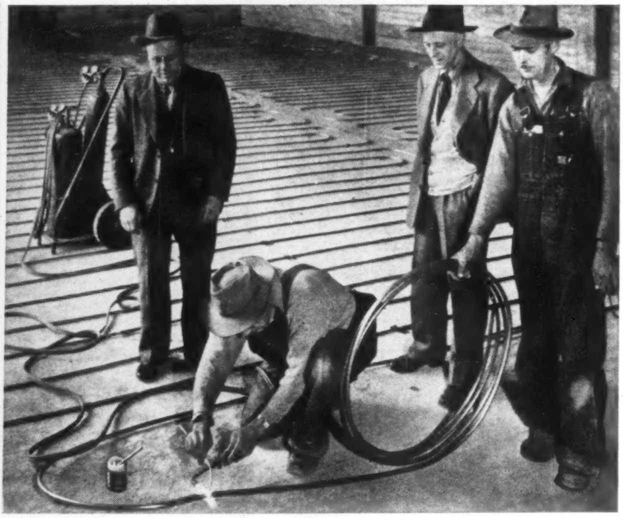
**"Freon" is Du Pont's registered trademark for its fluorinated hydrocarbon refrigerants.*

Three men in agreement:

Tube joints brazed with SIL-FOS and EASY-FLO are best...

FOR WATER SYSTEMS, FOR AIR-CONDITIONING SYSTEMS, FOR HEATING SYSTEMS





Architects, Engineers and Plumbing Contractors all find that silver brazing nonferrous pipe and tubing systems with Handy & Harman SIL-FOS or EASY-FLO is the simplest, surest, most economical way to permanently bond all joints. Here's why:

1. *Simplest because* silver brazing eliminates all threading, cuts way down on handling and assembly time.
2. *Surest because* SIL-FOS and EASY-FLO joints are stronger than the parent metal itself. Creep, vibration, turbulence are minimized...joints are positive, leak-tight, maintenance-free.
3. *Most economical because* silver brazing permits use of lightweight tubing—saves tons in weight and in material, installation and handling costs.

New structures of every description are getting the "brazed joint treatment" in their water, air-conditioning and heating systems...let us show you how Handy & Harman silver alloy brazing can make the next job you do easier and more profitable.

YOU'LL BE OFF TO A GOOD START WITH THESE:

Bulletin 17—How to Braze Pipe and Tubing

Bulletin 20—Tells and shows you why and how SIL-FOS and EASY-FLO make leak-tight and maintenance-free joints a permanent certainty

Brazing News #71—Tells why plumbing contractors for office buildings, institutions, apartments are "brazing in" with SIL-FOS and EASY-FLO

DISTRIBUTOR LIST

There's an authorized SIL-FOS and EASY-FLO distributor near you. If you don't know his name, our Distributor List will tell you who and where he is; send for it.

Your NO. 1 Source of Supply and Authority on Brazing Alloys

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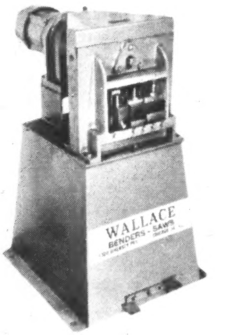
EQUIPMENT DEVELOPMENTS

Continued



Tube Notcher . . .

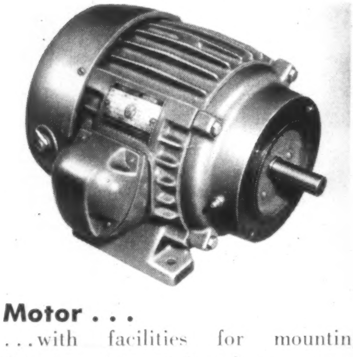
. . . designed to make fit-up joints for welding—*Wallace Supplies Mfg. Co., Dept. HPAC, 1300 Diversey Pkwy., Chicago 14.*

Is said to be fast, flexible, easy to operate, and be compact and require no clamps. Contains up to four sets of dies which can be changed or inserted quickly, says company. In five models with maximum tubing capacities 1 to 1 in. OD.

Instruments . . .

. . . with new rectangular panel design—*Simpson Electric Co., Dept. HPAC, 5200 W. Kinzie St., Chicago.*

"Wide-Vue" units feature open face design, longer scale lengths. Open faced cover designed to permit wide angle readability of scales. Custom built in 2½, 3½, 4½ in. models with any practical range, a-c and d-c, says company.



Motor . . .

. . . with facilities for mounting driven equipment directly to motor—*U. S. Electrical Motors, Inc., Dept. HPAC, Box 2058, Terminal Annex, Los Angeles 54.*

Spaced water troughs give MORE AIRFLOW between evaporator pads!

MAID-O'-MIST HUMIDIFIERS

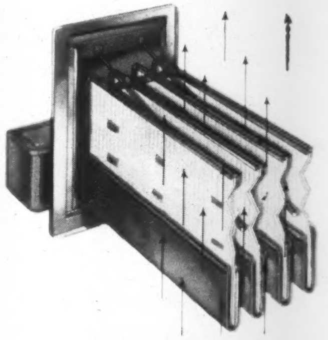
A mighty good job for mighty little

60% LESS AIR RESTRICTION IN PLENUM

50% LESS INSTALLATION TIME

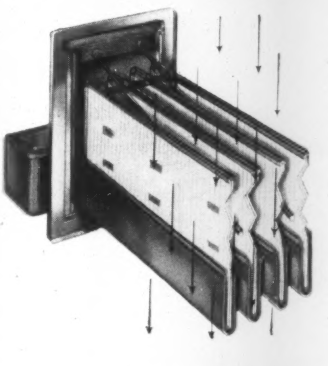
30% MORE EVAPORATION AREA

The ONLY convector humidifier that fits BOTH conventional and counterflow Warm Air Furnaces!



What a wealth of performance—at such low cost! MAID-O'-MIST changes parched air to a correctly humidified climate for little money, little effort. Perfect for plenums of all modern warm air furnaces.

For CONVENTIONAL Warm Air Furnaces: Installation is fast, easy. Cut opening in plenum and make water connections. No fitting or fastening to back of plenum. Unit is entirely supported by self-locking front plate.



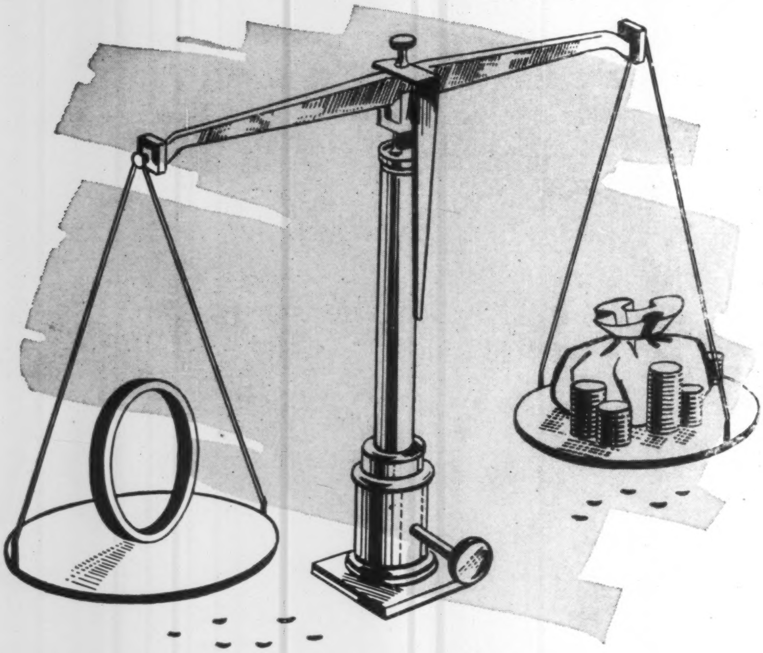
For COUNTER FLOW Warm Air Furnaces: Because of its narrow trough design, MAID-O'-MIST can be installed on either side of counter flow furnaces having a minimum air passage of 3 inches.

NOTE THE INGENIOUS DESIGN! ⅜" copper water troughs are spaced an inch apart to allow fast, effective unrestricted air-flow between the evaporator pads. Here's 30% more evaporation area!

Get detailed information on these inexpensive units from your jobber or write directly to MAID-O'-MIST.

MAID-O-MIST Inc.

MAID-O'-MIST, Inc.
3217 NORTH PULASKI ROAD · CHICAGO 41, ILL.



THE WORLD'S MOST EXPENSIVE PIPING!

- Less than an inch may cost thousands of dollars.
- No one orders it, yet it appears in every installation.
- It can be measured but not located.
- When opposed it can exert sufficient force to buckle the toughest steel.
- Its presence is often accompanied by distracting noise and vibration.

It is of course, the amount of thermal expansion in heating and piping systems.

La Favorite reinforced all-rubber expansion joints are the most practical means yet devised to eliminate damage and noise caused by thermal expansion, contraction and vibration. Because they compensate, because they are corrosion-free, because they have no moving parts to wear, your piping is kept safe and silent indefinitely.

For a more complete story on La Favorite's "*know-how in rubber*" send for your copy of Bulletin 55. Additional personal service is as near to you as your telephone.

LA FAVORITE *Rubber Mfg. Co.*

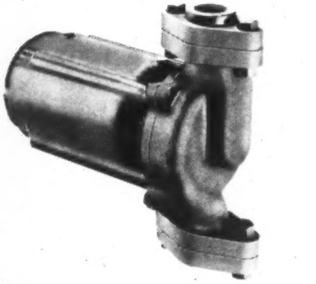
256 Wagaraw Road • Hawthorne, New Jersey

876

EQUIPMENT DEVELOPMENTS

Continued

Accurate alignment provided by means of totally-enclosed, NEMA style "C" bracket with tapped holes for bolting from driven equipment side, says company. Available in 1 to 30 hp ratings.



Booster Pumps . . .

. . . for circulating heating and cooling water for apartments, hotels, other buildings—*Piqua Machine & Mfg. Co., Dept. HPAC, Piqua, Ohio.*

Designed to be lightweight and compact, units available in six sizes. "Enpo" pumps recommended by company for copper pipe mounting, are said to save much space that is otherwise wasted.

Smoke Alarm . . .

. . . for use with unattended heating plants—*Photobell Co., Inc., Dept. HPAC, 43 Vesey St., New York 7.*

"Type SM1" electric eye type unit is said to require no maintenance. Electric eye has no electronic tubes, no internally generated heat, no warmup delay, says company. Ordinary lamp used for exciting photocell.

New boiler at Mando burns coal the modern way for economical steam generation

Consult an engineering firm

Designing and building hundreds of heating and power installations a year, qualified engineering firms can bring you the latest knowledge of fuel costs and equipment. If you are planning the construction of new heating or power facilities—or the remodeling of an existing installation—one of these concerns will work closely with your own engineering department to effect substantial savings not only in efficiency but in fuel economy over the years.

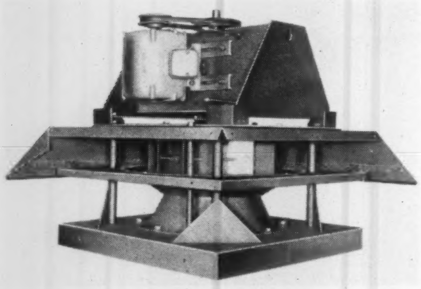
facts you should know about coal

In most industrial areas, bituminous coal is the lowest-cost fuel available • Up-to-date coal burning equipment can give you 10% to 40% more steam per dollar • Automatic coal and ash handling systems can cut your labor cost to a minimum. Coal is the safest fuel to store and use • No smoke or dust problems when coal is burned with modern equipment • Between America's vast coal reserves and mechanized coal production methods, you can count on coal being plentiful and its price remaining stable.

Mando—the Minnesota and Ontario Paper Co.—is keeping pace with continuing production expansion. The firm recently installed in its plant at International Falls, Minn., one of the largest modern single-pass boilers in the pulp and paper industry. It is designed to produce 240,000 lbs. of steam an hour, bringing the mill's steam generating capacity to 960,000 lbs./hr. The new boiler has 22,500 sq. ft. of heating surface and required 300,000 lbs. of steel in its construction. It will use 775,000 gallons of water a day and, for economy, will burn pulverized coal as a primary fuel—300 tons daily!

For further information or additional case histories showing how other plants have saved money burning coal, write to the address below.

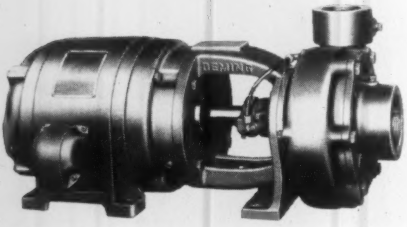
BITUMINOUS COAL INSTITUTE
Southern Building • Washington 5, D. C.



Power Roof Ventilators . . .

. . . with "Jet Siphon" feature—*Clarage Fan Co., Dept. HPAC, Kalamazoo, Mich.*

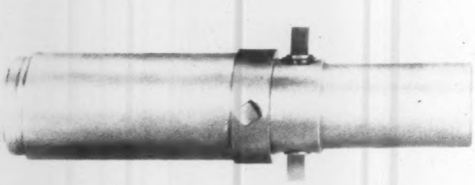
Advanced aerodynamic design is said to produce stable, highly efficient, quiet operating unit. Constructed to give static pressures to 2 in. Recommended by company for applications where ductwork or hoods may impose considerable resistance, as well as for light duty applications without ductwork. "Centrilator" built in 10 standard sizes with capacities to 26,400 cfm.



Centrifugal Pumps . . .

. . . for use in manufacturing, chemical, paper, contracting, other industries—*Deming Co., Dept. HPAC, Salem, Ohio.*

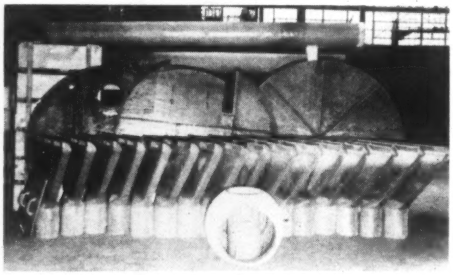
"Motor-Mount" units designed to deliver to 1200 gpm with heads to 220 ft. Line includes three separate units of various sizes, pumping ranges. Cited features: one piece shaft, stainless steel shaft sleeve, enclosed type impeller with non-overloading characteristics. Furnished with either stuffing box or mechanical shaft seal.



Nipple Chuck . . .

. . . designed for on-the-job threading of pipe nipples of any length with either hand threaders or power drives—*Mercury Hydraulics, Inc., Dept. HPAC, 2440 Blake St., Denver 5.*

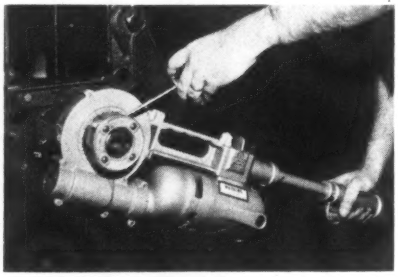
Due to movable sleeve guide, there are no "dead spots" to prevent threading to any predetermined length, says company. Operates as follows: thread one end of pipe and cut to required length; clamp nipple chuck in either vise or power drive and screw "bald" nipple into holding bushing; with threaded guides opened to maximum, thread in usual manner, then release holding cam and finished nipple will unscrew by hand.



Tanks, Fume Ducts, Hoods, Towers . . .

. . . other process equipment fabricated of fire resistant, corrosionproof plastic—*Haveg Industries, Inc., Dept. HPAC, 900 Greenbank Rd., Wilmington 8, Del.*

"Haveg 6610", plastic resin reinforced with glass fiber is said to provide complete corrosion resistance to wide range of conditions. Will not support combustion, said company.



Portable Pipe Threader . . .

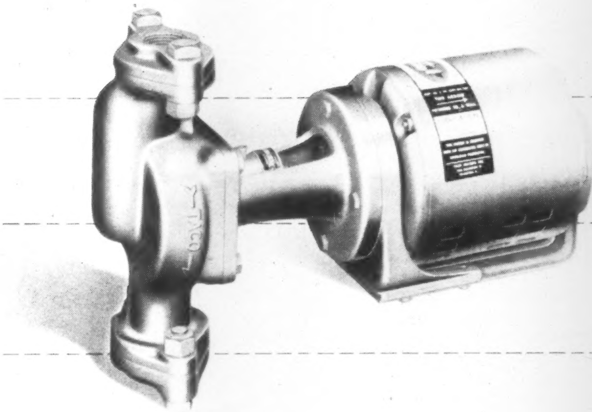
. . . with safety, time, labor saving features—*Velocity Power Tool Co., Dept., HPAC, 201 N. Braddock Ave., Pittsburgh 8.*

"Lawco Jr." weighs 20 lb, is 27 in. long. In use, operator applies threading die to tool, places tool in position on pipe, squeezes trigger switch. 3/4 hp, 110 volt, a-c or d-c motor drives threading dies. Equipped with toggle switch to provide reversible power.

Manifold Valves . . .

. . . in two models for pneumatic installation—*Petrometer Corp., Dept. HPAC, 43-22 10th St., Long Island City 1, N.Y.*

Both models feature "foolproof" manifold operation and quick, air tight action without necessity for turning and tightening handwheels, says company. For

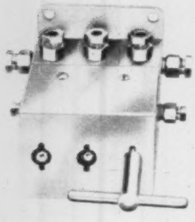


One circulator stands alone for quality, performance, dependability

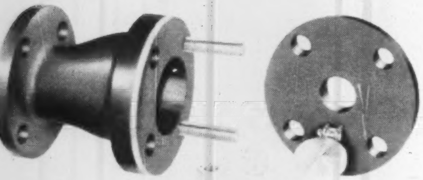
BETTER HEATING
Taco
BETTER WITH TACO

TACO HEATERS, INCORPORATED
1160 Cranston Street • Cranston 9, R. I.

For full information on the complete Taco line of circulators write for Technical Data Sheet TDS5



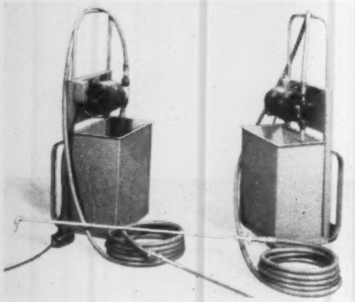
pneumatic instrument and control installations, other pneumatic systems. "Model 1563" (left) is duplex type which consists of two mechanically linked, two-port, two-position piston type valves normally held by spring tension. "Model 1583" (right) consists of two-position piston sliding and two-port cylinder, and is normally closed.



Horizontal Swing Check Valve . . .

. . . with rubber lined construction—*La Favorite Rubber Co., Dept. HPAC, Wagaraw Rd., Hawthorne, N.J.*

Recommended by company for use in acid, chemicals lines. Body is rubber lined cast iron or fabricated steel. Flow reduction is said to be negligible. In sizes 1 to 14 in.



Portable Cleaning, Descaling Unit . . .

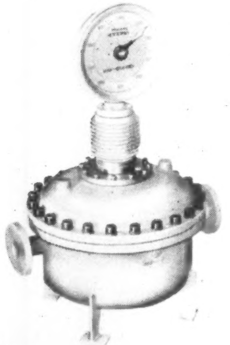
. . . for use by heating, air conditioning servicemen—*Hastings Air Control, Inc., Dept. HPAC,* 3215 *Leavenworth St., Omaha* 5.

"Clean-It" designed to handle acid solutions, as well as ordinary solvents. Recommended by company for cleaning all types of condensers, coils, cooling towers, air handling units, blowers, water heaters. Consists of two portable tanks, each with its own pump, hoses, spray or suction fittings.

Portable Man-Cooling Fan . . .

. . . that can be anchored to floor for permanent installation or moved into desired position on steel wheels—*Detroit Blower Corp., Dept. HPAC,* 9867 *Pacific Ave., Franklin Park, Ill.*

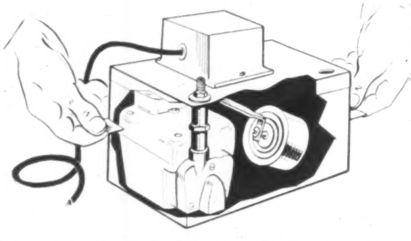
"Type P" axial-airfoil unit designed for variety of industrial uses. In 24 to 48 in. sizes. Swivel mounting permits air blast to be directed either up or down in 90 deg arc. Cited feature is aerodynamic hub and blade design.



Positive Displacement Flow Meter . . .

. . . for hard-to-handle fluids such as bunker oils, still bottoms, asphalt—*Brooks Rotameter Co., Dept. HPAC, Lansdale, Pa.*

Available in sizes 1 to 6 in. or up to 450 gpm capacity. For temperatures to 660 F, pressures to 600 psi.



Miniature Condensate Pump . . .

. . . for removal of condensation in mechanical refrigeration, air conditioning units—*S. Gelber and Sons, Inc., Dept. HPAC,* 5806 *N. Lincoln Ave., Chicago* 45.

Cited features: motor hermetically sealed in oil and cannot become wet; positive action mercury switch rubber coated, making it waterproof; no protruding parts outside tank; inner tank is neoprene, outer is steel; compact size.

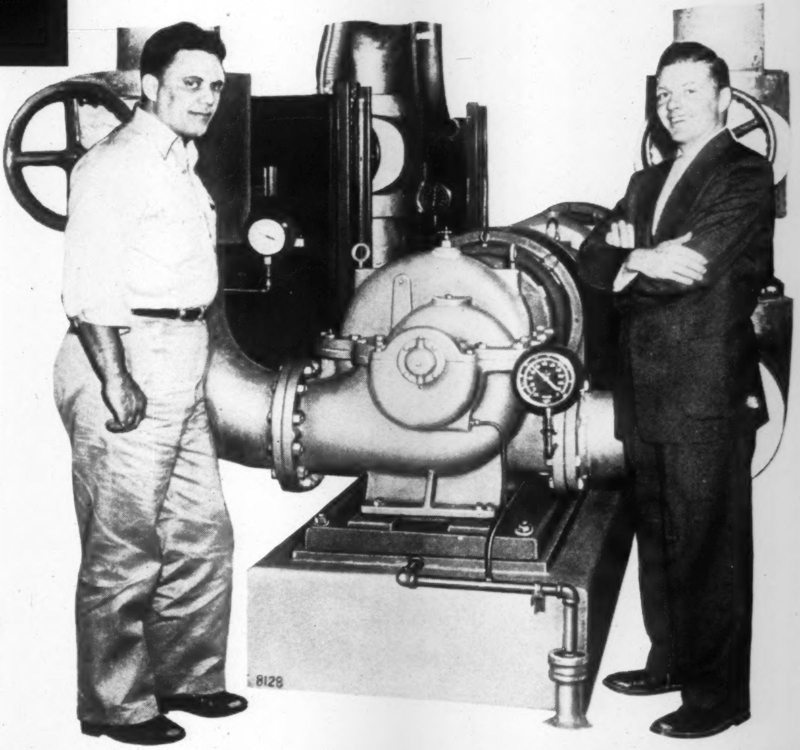
Sheet Metal Duct Crimper . . .

. . . with "compound leverage" feature said to multiply hand pressure to provide high crimping power with minimum effort—*Niagara Machine & Tool Works, Dept. HPAC,* 683 *Northland Ave., Buffalo.*

DE LAVAL

CENTRIFUGAL PUMPS

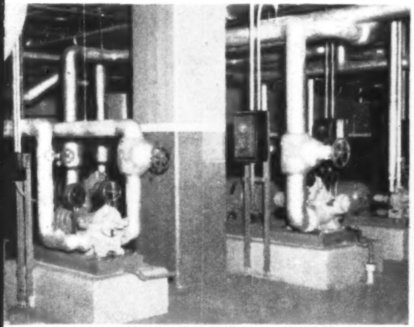
selected by contractor for "long service at low cost"



Ten De Laval centrifugal pumps were installed in the new Shell Oil Building, New Orleans, La. by Emile M. Babst Company, the Mechanical Contractor. "De Laval pumps were selected," Babst reports, "because we know that we can count on their dependability. They are built to give long service at low cost."

De Laval single stage centrifugal pumps are being used for a wide variety of applications in commercial and industrial buildings. For complete data on these units, write for Bulletin 1002.

Shown are Edmund Dolese, Chief Building Engineer (at left) and Robert Ralston of the Emile M. Babst Company, Mechanical Contractor (at right). Architects—August Perez & Associates, Consulting Engineers—Leo S. Weil & Walter B. Moses, General Contractor—Gervais F. Favrot Co., Inc.



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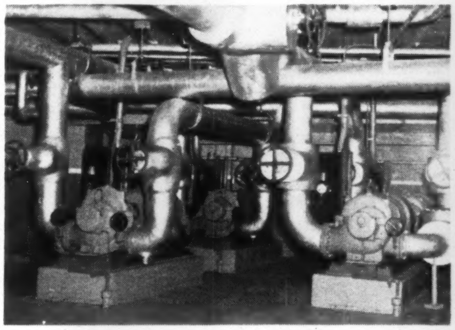

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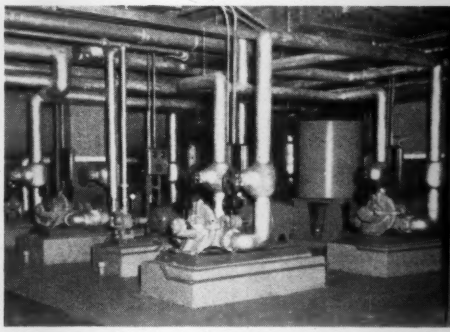


C

The new 14-floor Shell Oil Building in New Orleans has 300,000 sq. ft. of rental area, which is occupied by 45 tenants.

A Two De Laval GS pumps are used for hot water circulating. They operate at 75 gpm and 30 ft. head.

B Four De Laval K pumps are used for coil water service (1800 gpm and 168 ft. head) and condenser water service (2480 gpm and 130 ft. head).

C Four De Laval I pumps are used for cooling tower make-up (115 gpm and 145 ft. head) and house pump service (270 gpm and 174 ft. head).

DE LAVAL *Centrifugal Pumps*

DE LAVAL STEAM TURBINE COMPANY

871 Nottingham Way, Trenton 2, New Jersey

DL-361

IF IT'S A "MOTORPUMP" IT HAS A BUILT-IN

Reputation

One sure way to minimize costly call-backs on air conditioning pump installations is to start out with a unit you *know* will stand up on the job without need for excessive maintenance.

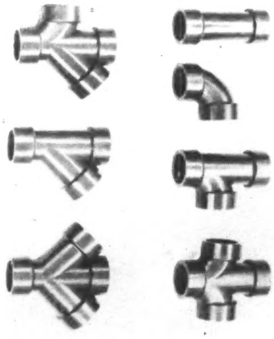
By standardizing on Ingersoll-Rand Motorpumps you are offering your customers modern, efficient pumps designed specifically for air conditioning systems. Today, on all types of installations, thousands of Motorpumps are delivering the maximum in efficient, trouble-free operation.

Ingersoll-Rand
11 Broadway, New York 4, N.Y.

Motorpumps are available from ¼ to 75 horsepower. Write for our latest literature covering the Motorpump for air conditioning service.

9-594

With capacity to 20 gage galvanized steel, tool makes it easier to reduce diameter of sheet metal ducts, said company. With $1\frac{1}{4}$ in. blades, two crimps are made each time jaws are compressed. Constructed to be rugged, lightweight.



PVC Pipe, Fittings . . .

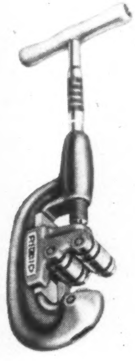
. . .engineered to cut cost of draining corrosive liquids—*Tube Turns Plastics, Inc., Dept. HPAC, 2929 Magazine St., Louisville* 11.

Sizes of new polyvinyl chloride drainage fittings range $1\frac{1}{2}$ to 4 in. They match schedule 40 PVC pipe of corresponding dimensions, are available in form of elbows, T's, Y's, other standard branch connections.

Room Air Conditioners . . .

. . .in new six model line—*Perfection Industries, Div. of Hupp Corp., Dept. HPAC, 1135 Ivanhoe Rd., Cleveland* 10 .

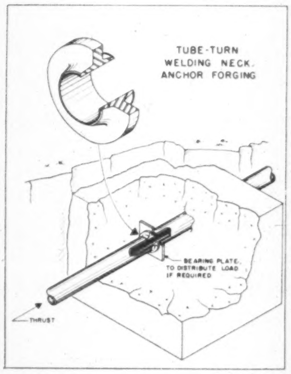
"Silhouette 17" series, four models, available in low amp and normal amperage models in $\frac{3}{4}$, 1 hp sizes. Cited features are thermostat control, outdoor air intake, 6 gal per day moisture removal capacity. "Super-Cooler 30" units supplied in $1\frac{1}{2}$, 2 hp sizes.



Pipe Cutter . . .

. . .designed for heavy duty use—*Ridge Tool Co., Dept. HPAC, Elyria, Ohio.*

Extra wide roll built into "No. 202 Wide-Roll" unit features double bearing surface on pipe. Roll sets, holds revolving pipe at perfect right angle, says company. Is said to facilitate quick, clean starts for perfect tracking and straight cuts. Larger screw handle engineered for easier cutting adjustment for hand or power use.



Anchor Forging . . .

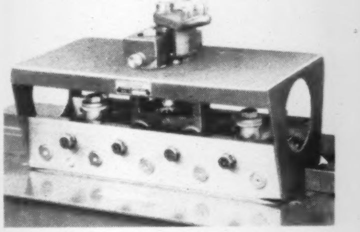
. . .designed to hold high pressure piping, cut costs—*Tube Turns, Div. of National Cylinder Gas Co., Dept. HPAC, 224 E. Broadway, Louisville* 1, *Ky.*

Welding neck anchor is said to solve problem of how to anchor high pressure oil, gas pipe lines—particularly at compressor stations, river crossings, valve and meter setting. Hubs are butt welded to pipe where it is to be held, and assembly is buried in reinforced concrete block. Available in variety of sizes for usual pressure conditions.

Packing Materials . . .

. . .of silicone rubber—*Garlock Packing Co., Dept. HPAC, 402 Main St., Palmyra, N.Y.*

Recommended by company for many applications because of its resistance to aging, sunlight and ozone, low compression set. Is also said to withstand high and low temperatures, have good dielectric properties. Manufacturer's products include diaphragms, gasketing, sheet packing, oil seals, rings, insulation tape, rod and valve stem packing.



Flanger . . .

. . .engineered to automatically follow any edge fed into it—*Lockformer Co., Dept. HPAC, 4615 W. Roosevelt Rd., Chicago* 50.

According to manufacturer, "Auto-Guide" turns perfectly uniform flange every time, regardless of shape involved. Has capacity of 20 gage metal or lighter. Turns 7/32 in. flange. Forming speed is 16 to 18 fpm.

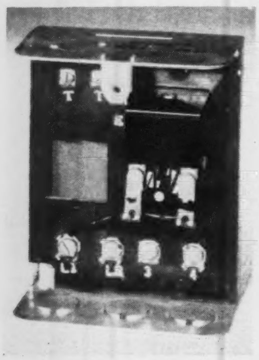
Switching Relays . . .

. . .for controlling $\frac{1}{2}$ to 2 hp cooling compressors—*Minneapolis-Honeywell Regulator Co., Dept. HPAC*, 2753 *Fourth Ave., S., Minneapolis* 8.

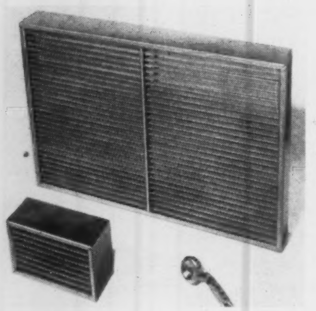
Designed to give precise control of relatively high current by low amperage thermostat. Units also suitable for other motor control applications, says company, including room air conditioners, other refrigeration devices, circulating and ventilating fans, water circulators and

EQUIPMENT DEVELOPMENTS

Continued



multiple convector fan units, fan coil units, and unit heaters, electric non-inductive loads, other motor loads to 3 hp.



Eliminator . . .
. . . for cooling towers—*Quick Plastics Div., Quick Industries, Inc., Dept. HPAC, 1606 Cooper St., Jackson, Mich.*

Made completely of styrene plastic. Cited advantages of unit are: will not corrode; is lighter in weight; costs less.

Coatings . . .
. . . for seams of bellows, other pliable parts—*A&A Mfg. Co., Inc., Dept. HPAC, 2017 W. Clybourn St., Milwaukee 3.*

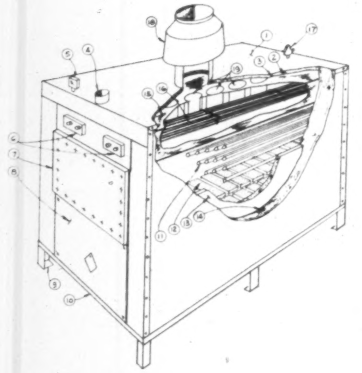
Formulated to cover joints between remote manipulators and walls, prevent escape of radio-activity through these joints. Bellows form continuous seal between manipulator shaft and "hot side" of wall, says company.

Bonding Agents . . .
. . . formulated to provide durable, impact resistance bonds to metals, plastics, wood, glass, concrete, other surfaces—*H. B. Fuller Co., Dept. HPAC, 181 W. Kellogg Blvd., St. Paul.*

"Resiweld" plastic alloys available in five different types. Are said to resist sag or flow. Recommended by company for filling cracks, sealing, patching, caulking seams and other applications where heavy build-up of material is necessary.

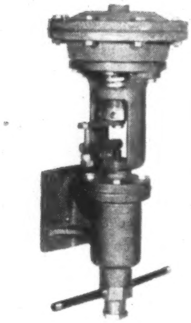
Aerosol Degreaser . . .
. . . for cleaning burner parts, filters, other oily or greasy equipment—*Stewart-Hall Chemical Corp., Dept. HPAC, P. O. Box 66, Fleetwood Station, Mount Vernon, N.Y.*

Product is sprayed onto area to be cleaned, wiped off with rag or held under water faucet and rinsed off.



Gas Fired Boilers . . .
. . . for steam, hot water systems—*Ajax Boiler & Heater Co., Dept. HPAC, 1519 West 132nd St., Gardena, Calif.*

Cited features include: built-in exchangers available with maximum capacity to equal boiler output; removable head plates provide easy access to the main tube bundle; built-in heat exchangers removable for inspection. For working pressures: 15 lb steam, 125 lb hot water.



Pilot Control Valve . . .
. . . for use with diaphragm actuated regulating valves—*Atlas Valve Co., Dept. HPAC, 280 South St., Newark, N.J.*

Is said to respond to small variations in controlled pressures in flow line, thereby readjust main regulator for precise throttling of steam, gas or liquid flow. Is positive mechanical device designed to eliminate leakoff of hydraulic fluid while still retaining sensitive control of diaphragm control valve, says company. Controlled pressure ranges are 3-15, 10-40, 25-100 psi.

Pressure Control . . .
. . . with two separate switches that operate independently of each other for controlling two independent circuits—*United Electric Controls Co., Dept. HPAC, 79 School St., Watertown 72, Mass.*

Seven models offered in variety of adjustable ranges between zero and 250 psi limits, maximum pressures to 350 psi. On-off switch differentials between limits of 5 to 10 psi, depending on model, are obtainable. In three standard types: normally open, normally closed, double-throw with no neutral position.

Filter Pump . . .
. . . with special filter medium to remove particles down to one micron in size from acid or alkaline electroplating and industrial solutions—*Sethco Mfg. Co., Dept. HPAC, 70-78 Willoughby St., Brooklyn 1.*

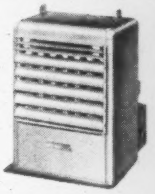
Plastic, self-priming units designed for handling agents such as chromic, fluboric and nitric acids that are to

MUELLER CLIMATROL PLANNING AIDS . . .

. . . CLIMATE CONTROL FOR HEALTHFUL LIVING

Mueller Climatrol Unit Heaters Win Wide Favor in Multi-Unit Commercial Buildings

Because they save construction and labor costs required to install central heating plants and ducts, Mueller Climatrol unit heaters are the ideal choice for multi-store shopping centers and similar installations. In fact, their steady warmth and high fuel efficiency win friends fast in any space heating application. Made in many sizes for either gas or oil-fired operation.



Quick response to demands for heat is assured with either manual or automatic regulation, thanks to horizontal air tube construction of heat exchanger which speeds heat transfer.

NATIONAL
ATIONAL
HARDWARE
KUBIAK PHARMACY

FOR MODERN SHOPPING CENTER—Mueller Climatrol furnished unit heaters in each of the 13 individual stores, in addition to complete heating and cooling systems for offices located on the second floor.

Here's Most Complete Size Range Of Floor-Mounted Fan Coil Units

Wherever there's call for year-round comfort using central cooling and hot water heating — step into profit position with individually controlled Mueller Climatrol Fan Coil Units. Recessed and cabinet types in 200, 300, 400 and 600 cfm sizes feature:

TWIN BLOWERS. Draw room air through permanent filter, blend it with outside air if desired, force it over coil circulating hot or cold water.

FOUR-ROW COIL. Better dehumidification.

ADJUSTABLE FAN CONTROL. Easy selection of desired output avoids air zoning and load problems.

SIMPLE PIPING. Just three — water supply and return, condensate drain.

Mueller Climatrol Warranties Offer Exceptional Protection For Residential Installations

In cooling, Mueller Climatrol not only protects you and your customers against defects in *any part* of the refrigeration cycle, but PAYS A LABOR ALLOWANCE should service be needed. *Furnace warranty* not only covers all parts for one year, but the heat exchanger for TEN!

SEE YOUR MAN FROM MUELLER CLIMATROL **for the full story on America's most complete line of heating and cooling equipment. For specifications and installation information, write for literature.**

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EQUIPMENT DEVELOPMENTS
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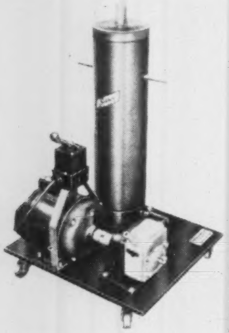
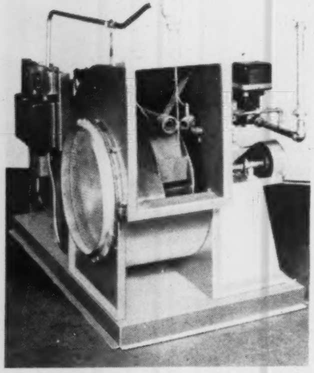


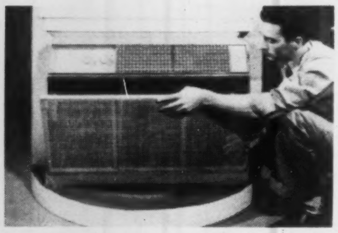
be circulated and continuously filtered. Filtering medium made of "Dynel," acrylic fiber manufactured by Union Carbide and Carbon Corp.



Heater . . .

. . . which applies burner directly to scroll—*David-Ludwig Co., Dept. HPAC, 14290 Goddard, Detroit.*

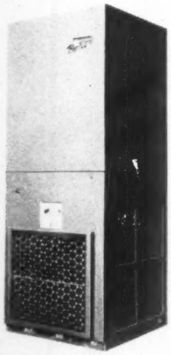
Designed to provide simple, efficient heating for industrial plants. Is direct fired gas heater that combines both fan and mixing chamber into one unit. Available in sizes to 100,000 cfm, 10 million Btu.



Air Conditioner . . .

. . . designed as flush-fitting, wall-mounted unit that cools in summer, heats like steam or hot water radiator in winter—*Westinghouse Electric Corp., Dept. HPAC, P. O. Box 868, Pittsburgh 30.*

Contains heat convector that connects to steam or hot water pipes. Same fan which circulates cool air in summer also circulates warm air in winter. Measures 31 in. wide, designed to fit under window. In ¾, 1 hp models.



Heat Pump . . .

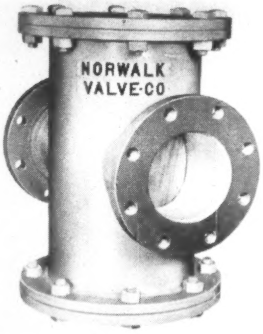
. . . in new line of water-to-air, air-to-air, water-to-water units for commercial use—*Typhoon Heat Pump Co., Dept. HPAC, Tampa, Florida.*

In sizes to 40 tons. Designed for economical installation. Corrosion resistant metal condensers with multiple tube-in-tube design features greater heat transfer surface, uniform operating temperatures, says company.

Lifters . . .

. . . for raising, lowering, pulling jobs —*Wright Hoist Div., American Chain & Cable Co., Inc., Dept. HPAC, York, Pa.*

"Type C Pull-A-Way" unit recommended by company for variety of applications. In three capacities: 1½, 3, 6 tons. Standard lift is 5 ft.



Gas, Air Filters . . .

. . . for 6, 8 in. and larger pipe sizes —*Norwalk Valve Co., Dept. HPAC, South Norwalk, Conn.*

Equipped with built-in baffle said to assure maximum passage of gases, air through filtering material and give complete removal of dust, scale. Units are reversible end-for-end, top-for-bottom.

Gasketing Materials . . .

. . . formulated to have unusual flexibility characteristics—*Armstrong Cork Co., Dept. HPAC, Lancaster, Pa.*

"Accopac" asbestos fiber compound is said to withstand sharp bending without piping or cracking. Available in several types of rubber binders, can be supplied as roll goods, sheets, or die cut parts.

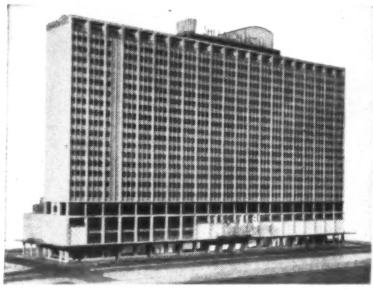
Valve Stem Packings . . .

. . . for high pressure and/or high temperature service—*Garlock Packing Co., Dept. HPAC, 403 Main St., Palmyra, N.Y.*

Asbestos braid jacketed plastic core packings in two new styles, both utilizing inconel wire in packing

B.F.Goodrich

Cell-Tite® Tubing saves Sheraton a cool $9,517.26



Philadelphia's new Sheraton boasts 8,100 feet of B. F. Goodrich Cell-Tite Tubing on water lines of 1,000 room air conditioners, and for good reason!

Saves labor costs: "With Cell-Tite Tubing," says Mr. Earle Baltz, executive of Achenbach & Butler, Inc. insulation specialists, "we cut the time needed to put insulation on two lengths of pipe from a normal three hours to only 20 minutes. This individual saving of two hours and forty minutes became a saving of 2,666 man-hours on the whole job. Labor on this costs $3.57 per hour — multiplied by the total time, making a saving of $9,517.26!"

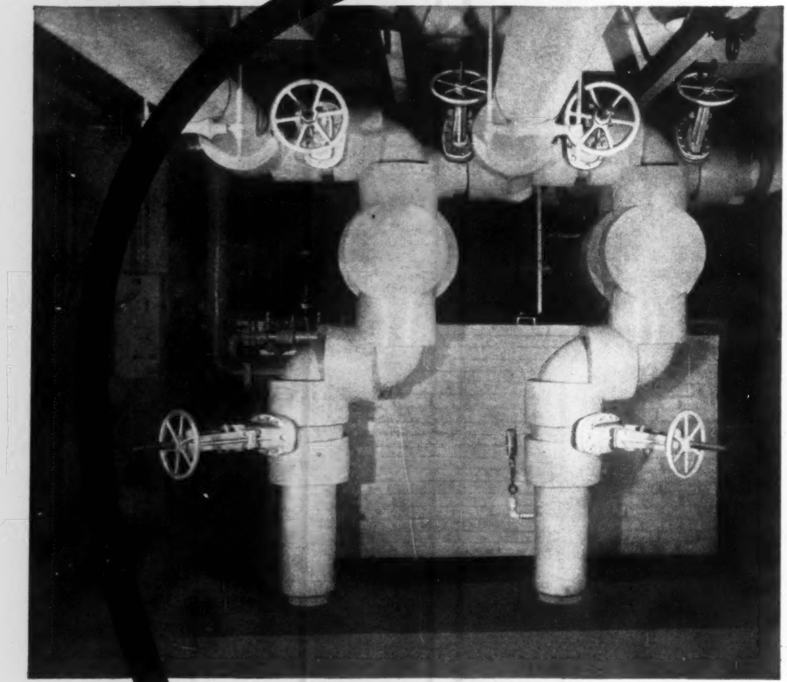
Why they selected Cell-Tite: "Cell-Tite effectively prevents condensation on pipes carrying cold water through warm areas, holds heat of hot water in pipes. The material suffers no effects from constant exposure to maximum heat rating . . . continually holds up under heats approaching its rated 220° resistance, has a K factor of 27 giving maximum insulation without undue thickness, is consistent and uniform in quality and assures even all-around insulation by being of 'closed-cell' construction."

Easy to install: "This tubing cuts labor costs by easy-threading on pipe, fits around bends, gives a much neater appearance. To strip the ends, we held the Cell-Tite Tubing back clear of the connection, held it in place with wire. After the connection was made, the wire was cut and the insulation moved over the exposed section. Even after being wired in a compressed position for two months, Cell-Tite showed no permanent set!"

Get free booklet: For complete information and free booklet on Cell-Tite Tubing, Strip and Cord, write B. F. Goodrich Sponge Products, a division of The B. F. Goodrich Company, 381 Derby Place, Shelton, Connecticut.

B.F.Goodrich

SPONGE PRODUCTS



Proved DEPENDABLE

- Call it reliable!
- Call it rugged!
- Call it dependable!
- If it is a Fairbanks valve . . . it has it!

Thousands of installations under every condition from the simplest to the most difficult, prove Fairbanks valves give dependable service, require less maintenance, last longer — often succeed where other valves fail!

That is why you find more uninterrupted service, less shutdown, in plants that specify Fairbanks 125-pound Iron Body Gate Valves — the valves with proven dependability built in!

Fairbanks Iron Body Gate Valves are bronze mounted* both with inside non-rising screw and outside screw and yoke. Available with screwed or flanged ends. Bodies and bonnets made of high strength alloy cast iron. Wedges in 2" to 4" sizes of solid bronze; in larger sizes to 24", wedges are alloy iron with rolled in bronze face rings and bronze bushed stem connections. The threaded bronze seat rings are screwed into body at angle conforming to taper of wedge.

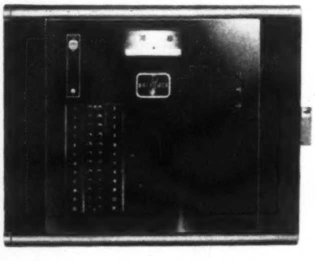
(*ALL IRON GATE VALVES ALSO AVAILABLE.)

THE Fairbanks COMPANY
393 LAFAYETTE STREET, NEW YORK 3, N. Y.
Branches: New York 3 • Pittsburgh 22 • Boston 10 • Rome, Ga.
TRUCKS • CASTERS • DART & PIC UNIONS • VALVES

jacket. "Style 5855" designed for general service packing where conditions are not extreme, i.e. top stuffing box temperature range of 500 to 600 F. "Style 127" formulated for use in packing any fluid which will not affect asbestos; for extreme heat conditions, such as box temperatures of 750 F and pressures to several thousand psi.

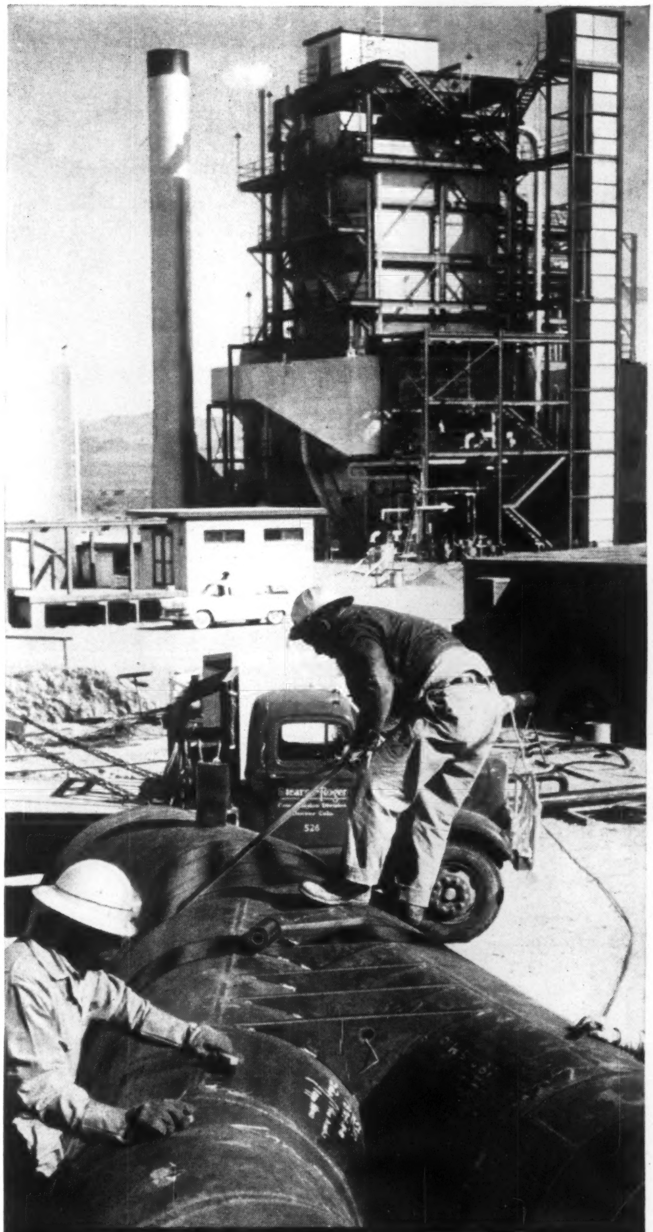
Boring Instrument . . .
. . . available in smaller, more compact, portable model—*J. F. Hamlin Co., Inc., Dept. HPAC, 746 Ellis St., San Francisco 9.*

"Kor-it, Jr." weighs 36 lb, is designed for fast cutting of holes in hard surfaces to 6 in. per min in diameters 3/16 to 2 in. Cited feature is way cutting is done to diameter desired, removing core in solid piece. ½ hp motor, operated on 110 or 220 volts, turns cutting bit 3400 rpm.



Drum-Type Indicator . . .
. . . engineered for quick readings of variables at remote points—*Bristol Co., Dept. HPAC, Waterbury 20, Conn.*

Uses company's standard "Dynamaster" electronic instrument com-



PRACTICAL PIPE PROTECTION

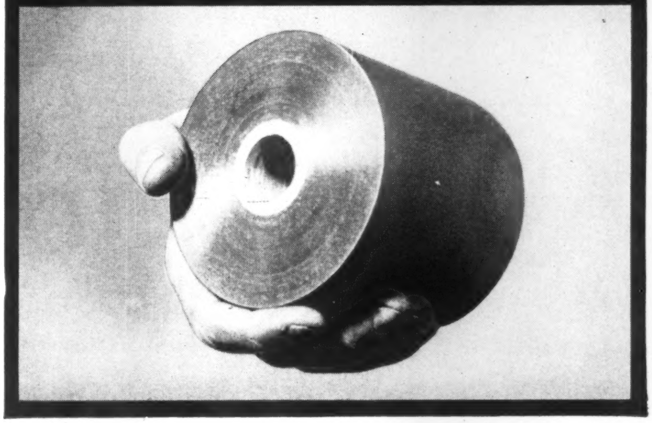
Practical protection for all pipe installations—and the only *practical* protection for some pipe coating jobs is "SCOTCHRAP."

That was the decision of the Stearns-Roger Co., Denver, when they had the job of coating these big pipes at a power station. Largest single pipes were 54 inches in diameter, tapering down to 36 inches. Stearns-Roger used "SCOTCHRAP" No. 51, 12 inches wide x 20 mils thick to wrap the pipes for complete protection.

Pressure-sensitive "SCOTCHRAP" is *polyvinyl chloride* plastic tape, tough enough to protect the biggest pipes; flexible enough to stand stress when pipe sags during final lifting into position. It can be applied on the job without heat and flame or special tools in absolute safety.

GET THE COMPLETE STORY. Send for free booklets describing protective qualities and easy application of "SCOTCHRAP." Just write on your letterhead to 3M Co., St. Paul 6, Minn., Dept. PD-47.

TAPE IT EASY



Quality pipe protection that rolls on dry...

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SCOTCHRAP
BRAND
PIPE INSULATION

The term "SCOTCHRAP" is a registered trademark of Minnesota Mining and Manufacturing Co., St. Paul 6, Minn. Export Sales Office: 99 Park Avenue, New York 16, N.Y. In Canada: P.O. Box 757, London, Ontario.

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EXPANSION
in heating systems . . .

SO CONNECTIONS MUST COMPENSATE

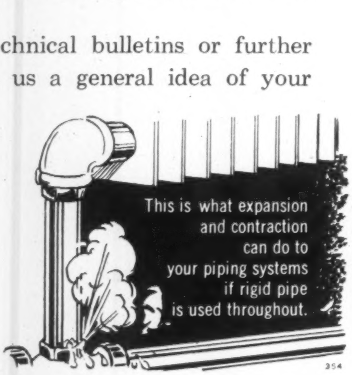
That's why Packless® is first and foremost in the design, engineering and manufacture of seamless metal flexible hose that

- *ABSORBS EXPANSION*
- *CONTROLS VIBRATION AND PIPE TRAVEL*
- *DAMPENS NOISE*
- *CORRECTS MISALIGNMENT*
- *PREVENTS PIPE DAMAGE*

A complete line of standard connectors, in sizes from ¼″ to 4″ I.P.S. are available for immediate delivery. Engineering service for *your* specific requirements is offered at no extra cost.

Call or write now for special technical bulletins or further detailed information. Please give us a general idea of your problem so that we may be of greater assistance to you.

Distributors and Representatives wanted: Some territories still open

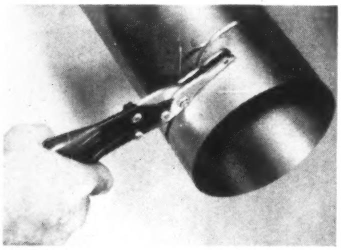


PACKLESS
METAL HOSE INC. 730-12 Winthrop Ave., New Rochelle, N.Y.

EQUIPMENT DEVELOPMENTS

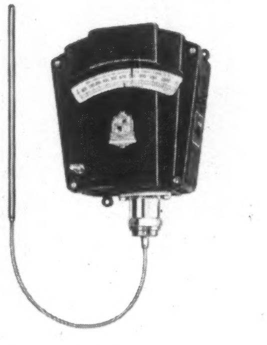
Continued

ponents. Equipped with numbered pushbutton switches on front of case. Revolving drum-type scale has calibrated lengths of over 26 in. Offered primarily in resistance thermometer and pryometer models, can also be supplied for measuring other variables, says company.



Sheet Metal Snips . . .
. . . featuring lower blade ground to triangular reamer point for making starter cut—*Peck, Stow & Wilcox Co., Dept. HPAC, Southington, Conn.*

Designed to eliminate need for punched or drilled starting hole. Is said to have good leverage for easy cutting.



Limit Control . . .
. . . for high temperatures—*Partlow Corp., Dept. HPAC, New Hartford, N.Y.*

Designed for fast acting precision control of critical temperatures necessary in many processing operations. Acts to cut off heat supply if predetermined temperature, set on calibrated scale, is exceeded. Scale and element ranges available are zero to 900, zero to 1100 F. ‡

THE NEW Airtherm AIR CONDITIONING UNIT

COMBINES THE BEST TIME-PROVED FEATURES IN THE INDUSTRY

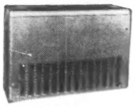
FOR NEW OR EXISTING

✓ OFFICES
✓ MOTELS
✓ HOTELS
✓ APARTMENTS
✓ INSTITUTIONS
✓ PUBLIC BUILDINGS

Here is Airtherm's answer to the demand for remote air conditioning without expensive ductwork. Features that have performed best in actual usage through the years are combined in this unit to give: (1) Maximum efficiency and operating life; (2) Quiet operation; (3) Versatility of installation; (4) Attractive appearance that blends with new or old buildings.

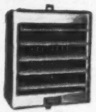
Airtherm units are made in four series from $\frac{1}{2}$ to 2 ton nominal cooling capacity for cabinet or concealed installation, floor or ceiling.

AIRTHERM HEATING AND VENTILATING PRODUCTS

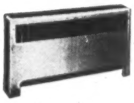


Cabinet
Unit Heater

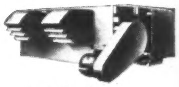
Gas Fired
Unit Heater



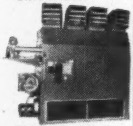
Propeller Fan
Unit Heater



Convectior



Centrifugal Fan
Unit Heater



Direct Fired
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MAIL COUPON FOR DETAILS

Airtherm Manufacturing Co., Dept. A
700 S. Spring • St. Louis 3, Mo.

Please send specifications on the following products as checked ☐ Airtherm Air Conditioning Units ☐ Cabinet Unit Heaters ☐ Convectors ☐ Gas Fired Unit Heaters ☐ Propeller Fan Unit Heaters ☐ Centrifugal Fan Unit Heaters ☐ Direct Fired Space Heaters.

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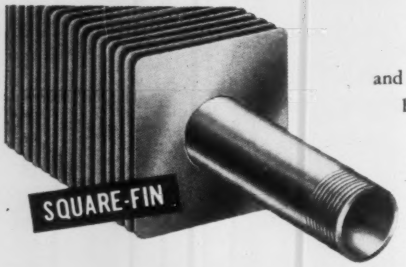


All *Slant-Fin* products — heating elements and enclosures — are advance-engineered and built to exacting specifications. Regardless of the application, *Slant-Fin* can meet your requirements either with a standard item from an extensive line or fabricate an assembly for your special needs.

WHEN YOU NEED FINNED-TUBE FOR HEATING...REMEMBER THESE

5 reasons

WHY YOU SHOULD ALWAYS SPECIFY

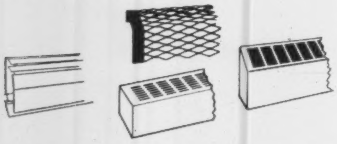
SLANT-FIN

1. Highest heat output

You have a choice of heating elements — the traditional Square-Fin Series or the distinctive Slant-Fin Series with many exclusive advantages. With greater surface per fin and interlocking fin-and-flange construction, these elements supply a high heat output per linear foot. A variety of fin spacings and tube sizes from ¾" to 2" provide a complete range of approved ratings.

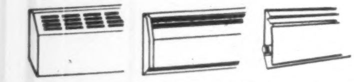
2. The most complete line for commercial heating

For office buildings, factories, churches, schools, hospitals and other large area heating installations, *Slant-Fin* radiators and enclosures are unsurpassed. Heating elements in 1¼" and 2" all-steel, all-copper or copper-aluminum provide maximum heating efficiency with economical material and labor costs. A wide range of enclosures from the practical expanded metal to the ultra-modern "low line" permits complete flexibility for individual requirements.



3. Residential baseboard, too

For private offices, hotel rooms, motels, or any small space where both heating efficiency and appearance are desired, *Slant-Fin's* complete line of residential baseboard is ideal. Again, you have a wide choice. Four different heating elements of ¾", 1" and 1¼" are available in all-steel or copper-aluminum. Three different enclosure styles, too.



4. Labor and material savings

Slant-Fin products are made to be installed in the shortest possible time. For example, snap-on enclosures eliminate the need for screws, tools or special mountings. And both heating elements and enclosures are supplied in pre-cut lengths, tailored to your job.

5. Special applications

For special industrial and commercial process applications, either heating or cooling, *Slant-Fin* has the engineering experience and exclusive production techniques to fabricate finned-tube to the user's particular needs. Whether made of stainless or galvanized steel, wrought iron or aluminum, the finished assemblies will meet the most rigid tests for quality construction and efficiency.

You owe it to your reputation to include Slant-Fin in your plans. Catalog 1000 describes Slant-Fin's commercial and residential line. Write today for your copy.

SLANT-FIN RADIATOR
CORPORATION

87-49H 130th Street • Richmond Hill 18, New York

RECENT TRADE LITERATURE . . .

▶ *AIR CONDITIONERS*—Manual contains 12 pages of engineering data on multizone type air conditioning equipment. Describes nine-model line of single unit equipment, which, via individual zone control, can simultaneously heat one area while cooling another, says company. Contains unit nominal rating table, selection and air friction data. *Drayer-Hanson, Div. of National-U.S. Radiator Corp., Dept. HPAC,* 3301 *Medford St., Los Angeles* 63.

▶ *AIR CONDITIONERS*—"Type 915" air cooled summer air conditioners for commercial, residential installation described, illustrated in 4 page bulletin. Unit is constructed with twin refrigerant systems to provide two-stage air conditioning resulting in better humidity control, more effective operation, says company. Folder also covers optional equipment. *Mueller Climatrol, Dept. HPAC,* 2005 *W. Oklahoma Ave., Milwaukee* 15.

▶ *AIR CONDITIONING*—Form No. LL-241 describes 1957 line of commercial packaged air conditioners in sizes 3 to 30 tons. Illustrations depict popular methods of unit application. *Airtemp Div., Chrysler Corp., Dept. HPAC,* 1600 *Webster St., Dayton* 1.

▶ *AIR CONDITIONING*—Descriptions, model dimensions, illustrations of commercial application of "waterless" air conditioning units in sizes 2 to 7½ hp presented in form No. LL-243. *Airtemp Div., Chrysler Corp., Dept. HPAC,* 1600 *Webster St., Dayton* 1.

▶ "*AIR DOOR*"—How "air door"—designed to protect entrance or opening against infiltration of dust, dirt, insects, foreign matter, weather, etc., without use of ordinary doors—op-

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This practical book is made up of outstanding papers and data on industrial piping selected from past issues of "Heating, Piping & Air Conditioning." It is a most comprehensive collection of case studies, showing how various difficult piping problems encountered in different industrial plants were successfully worked out by piping experts.

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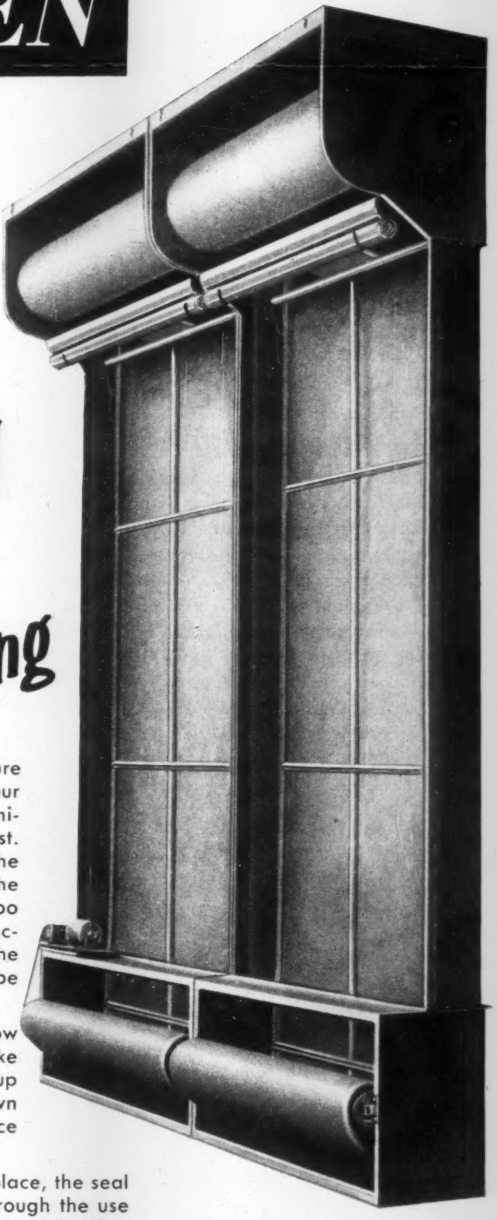
GREEN

Sure-Seal AIR FILTER



Fully Sealed while Indexing

Visualize, if you will, this Sure Seal Filter operating in your plant to rid incoming contaminated air of all dirt and dust. Being a very effective filter, the point will be reached when the filtering medium becomes too clogged to permit a satisfactory flow of air. The dirtier the air the sooner this point will be reached.

The filtering medium will now automatically change. The take up roll at the bottom will roll up the dirty medium, pulling down a fresh, clean section into place from the top roll.

While this change is taking place, the seal at the sides remains tight through the use of an ingenious counter-weighted floating tubular seal. Contaminated air cannot flow into the room around the edges when the medium is being changed.

Two methods are available for automatically changing or "indexing" the filtering medium: by pressure differential control (as would be the case outlined above) or by timed cycles.

The Green Sure Seal Air Filter is *surely* sealed, at all times. If you would be interested in all the details, send for our Bulletin #175. We would appreciate it if you would accompany your request with an outline of your problem. This unit comes in many sizes . . . from 12 to 370 square feet of filter area and up to 187,000 cfm in capacity.

THE GREEN FUEL ECONOMIZER CO.

BEACON • NEW YORK

Representatives in Principal Cities

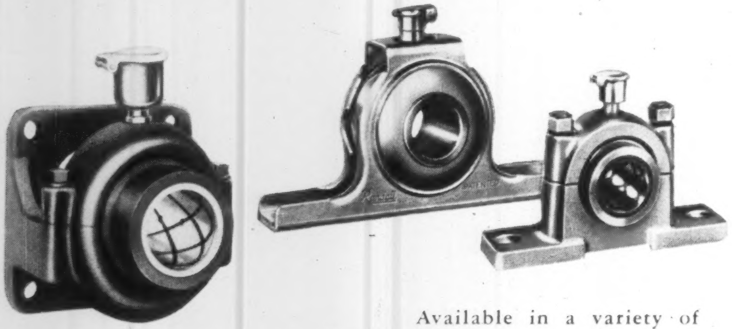
• quiet
• self-aligning
• self-lubricating

PILLOW BLOCKS

for Every Air-Moving Application

The unique design and flexibility of the exclusive Randall "DEEP-WELL"® ball assembly make it possible for Randall to supply the proper pillow block for every air-moving application.

Basic to every Randall Pillow Block is the "DEEP-WELL"® ball assembly containing a graphited cast phosphor bronze bushing, with Randall's exclusive graphite mixture. The graphite, in combination with supplemental lubrication, provides a perfect non-metallic cushion between the shaft and bearing surface. The large "DEEP-WELL"® reservoir automatically feeds the proper amount of lubricant to all parts of the bearing surface through porous graphite feed plugs and grooves—permitting extended operation without additional lubrication. Randall ball assemblies may be purchased separately for housings of your own design.



Available in a variety of standard housings and with different types of graphited or sintered bushings, Randall Pillow Blocks are designed so that alignment of the ball assembly with the shaft is automatic under all normal operating conditions. With the additional advantages of initial low cost and easier installation, you have good reason to contact your nearby Randall distributor. He's listed in the yellow pages of the telephone directory under "Bearings."

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RG2

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Clip this coupon to your letterhead, include your name and department and send it to Randall Graphite Bearings, Inc. We will send you the complete Randall Pillow Block Catalog.

RANDALL GRAPHITE BEARINGS, INC.
1012 S. Greenlawn Avenue, Lima, Ohio

RECENT TRADE LITERATURE

Continued

erates presented in 4 page form No. 1070. *Air Door, Inc., Div. of New Castle Products, Inc., Dept. HPAC, New Castle, Ind.*

▶ *AIR FILTERS*—Four page bulletin covers line of air filters designed for removal of foreign and dust particles in submicron range. Contains table of comparison data for various types. Includes dimensional drawings, along with performance and material data. *Flanders Mill, Inc., Dept. HPAC, Riverhead, N.Y.*

▶ *AIR FILTER*—"Roll-O-Matic" automatic renewable media air filter detailed in 8 page bulletin No. 248-B. Booklet contains description, illustrations, along with dimensional installation drawing and capacity tables. *American Air Filter Co., Inc., Dept. HPAC,* 373 *Central Ave., Louisville* 8.

▶ *AIR HANDLING UNITS*—Brochure presents "Roll-O-Vent" air handling units with new automatic air filtering principle. Models available include heating and ventilating unit, air conditioning unit, industrial unit heater. *Herman Nelson Products, American Air Filter Co., Inc., Dept. HPAC,* 215 *Central Ave., Louisville* 8.

▶ *AIR, VACUUM PUMPS*—New 16 page catalog No. 1957 describes rotary positive air and vacuum pumps, gas boosters, air motors. Gives details of construction, dimensions, capacities, performance curves, installations. Price list also available. *Leiman Bros., Inc., Dept. HPAC,* 102 *Christie St., Newark* 5, *N.J.*

▶ *BLENDER*—"Proportioneers" two component blender illustrated, described in 2 page bulletin. Contains flow diagrams, dimensional drawings, lists of features and applica-

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THERMAL AIR CONDITIONING EQUIPMENT

- *ENGINEERED FOR MAXIMUM EFFICIENCY*
- *BUILT FOR LONG LIFE*

CENTRAL PLANT CONDITIONERS
16 Casing Sizes—500 to 21,000 cfm

MULTIZONE CONDITIONERS
9 Casing Sizes—1500 to 21,000 cfm

Both Horizontal and Vertical Types

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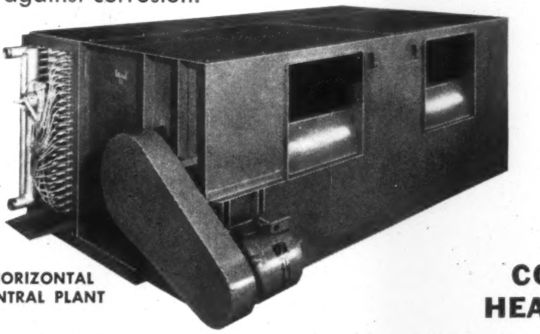
- Rugged sectional construction welded throughout.
- Cabinets fabricated of best quality, black, cold-rolled furniture steel bonderized and finished with baked-on enamel for strong protection against corrosion.
- Slide rails permit easy removal of coils for servicing.
- Fan sections rotatable to fit any discharge requirement.
- Vertically-mounted cooling coils in vertical units eliminate hold-up of condensate.
- Combination filter and mixing boxes for high or low velocity filters are available for all units.
- Central plant units obtainable with by-pass only, with internal face and internal by-pass, or internal face and external by-pass.



HORIZONTAL CENTRAL PLANT

THERMAL COOLING AND HEATING COILS

DIRECT EXPANSION COIL

- Fabricated of ⅝″ OD seamless copper tubing with helically-wound aluminum or copper fins (coils with copper fins solder-coated after fabrication).
- Coil types are direct expansion, chilled water, hot water, standard steam, and non-freeze steam.
- Sporlan distributors and expansion valves are standard on direct-expansion coils.
- Suction headers for direct-expansion coils are Type L copper.
- Supply and return headers on non-freeze steam coils are Type L copper, with steel connecting nipples.
- Supply headers on water and standard steam coils are Schedule 40 black steel pipe (copper headers available at slightly higher price).
- Coil tube sheets and top and bottom channels are #16 U.S.S. gauge galvanized steel.
- All coils are tested at 400 psig air pressure, under water.
- Available 1 to 10 rows — cooling; 1 to 4 rows — hot water; 1 and 2 rows — steam.

FASTEST SHIPPING SCHEDULE

THERMAL ENGINEERING CORPORATION

2605 W. Dallas **Houston, Texas**

QUALITY PRODUCTS SINCE 1945

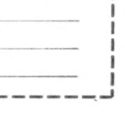
California contractor estimates:

Time and labor costs cut 75% with the Remington Stud Driver

Out on the California coast, "Research House for '56" is taking shape. It's an experimental house sponsored by Associated Architectural Publications and the latest tools are being used to build it—such as the Remington Stud Driver.

Contractor Bert Pickney says, "The Stud Driver cuts time and labor costs around 75% in anchoring beam supports, partition sills and furring to concrete. It took us only half a day to install the sills—a 2-day job with bolts. No pre-drilling and sills set tight! I certainly recommend the Stud Driver to any contractor!"

YOU CAN SPEED ALL STUD FASTENINGS —light, medium and heavy-duty—with the Remington Stud Driver. It sets *both* 1/4" and 3/8" diameter studs in steel or concrete—up to 6 studs a minute either size. The tool is cartridge-powered, portable, ready to work *anywhere*. Forty styles and lengths of Remington Studs to choose from. Get full details by mailing coupon.



Industrial Sales Division, Dept. H-4
Remington Arms Company, Inc.
Bridgeport 2, Conn.

Please send me your free booklet which shows how I can speed the job and save with the Stud Driver.

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*Firm*__________
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Remington

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STUD DRIVER

tions. *B-I-F Industries, Inc., Dept. HPAC, Providence, R.I.*

▶ *BLOWERS*—Four page bulletin features blower with perfect circle turbo design. Includes number of blower items in company's line. Shows several recent installations. *General Blower Co., Dept. HPAC, Morton Grove, Ill.*

▶ *BLOWERS, VACUUMS*—Eight page brochure illustrates, describes car wash equipment in manufacturer's line including blowers, vacuums. Includes dimensional drawings of dryers, table of specifications. *Airfan Engineering Co., Dept. HPAC, 7401 Telegraph Rd., Los Angeles 22.*

▶ *CABINET CONVECTORS*—New 28 page data guide describes cabinet convectors for steam, hot water heating systems. Lists details of cabinet design, construction features for installation in commercial, industrial, institutional, residential buildings. *Dunham-Bush, Inc., Dept. HPAC, West Hartford, Conn.*

▶ *CENTRIFUGAL PUMPS*—Line of "Motor-Mount" centrifugal pumps, designed for use in manufacturing, chemical, paper, contracting, other industries, described in 8 page bulletin No. 4200. Literature contains performance tables and dimensions, covers construction features. *Deming Co., Dept. HPAC, Salem, Ohio.*

▶ *COILS*—"Vapomatic" coils described in new catalog 12C7a. New information on installation instructions includes: addition of fluorinated hydrocarbon refrigerant No. 22 defrost line sizes; more complete wiring diagram, plus description of diagram. *Recold Corp., Dept. HPAC, 7250 E. Slauson Ave., Los Angeles.*

▶ *CONTROLS*—How to determine selection of proper controls for heat-

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REFINERIES
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. . . AND ABSOLUTE ACCURACY IS A NECESSITY . . . Look to the Lawler Type "S" Temperature Regulator to fulfill the requirements. Instant response, "hairline" control with rugged longer-lasting performance make the Type "S" the best temperature regulator available.

Hydraulically formed, non-ferrous bellows type thermostat guarantees instant correcting action in response to the smallest change from desired temperature setting. Highly polished stainless steel stem provides friction-resistant operation . . . rugged durability for a life-time of accurate control. Smaller temperature spread of the Type "S" allows for more accurate control . . . putting the valve into action as soon as the temperature goes off a single degree. No job is too tough . . . no application too unique for the Type "S" Temperature Regulator.

LAWLER TYPE "S" TEMPERATURE REGULATOR

DIRECT ACTING — Accurately controls all steam heating equipment. Protects against over heating . . . a rise in temperature above setting closes valve.

REVERSE ACTING — For cooling systems and recirculating lines. Rising temperature opens valve . . . drop in temperature causes valve to close.

THREE WAY — Mixes hot and cold liquids . . . delivers them at a constant pre-determined temperature.

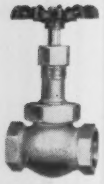
PERFORMANCE TESTED FOR LONGER LIFE

Steam Temperature Regulators
Thermostatic Shower Mixing Valves
Water Controllers
Tempering Valves

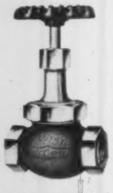
DESIGNERS AND PRODUCERS OF THERMOSTATICALLY OPERATED VALVES SINCE 1895

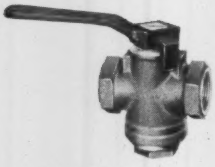
THE Lawler Line of Thermostatic Control Valves

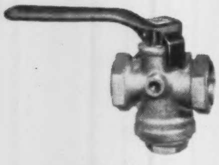
LAWLER AUTOMATIC CONTROLS, INC., MT. VERNON, N. Y.

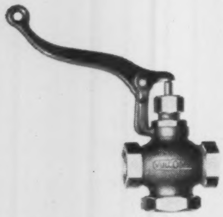

No. 107 Globe Valve

No. 1250 Gate Valve


No. 912 Globe Valve


No. 830 Stop Cock


No. 1296 Gas Cock


No. 840 Quick Operating Valve

DEPENDABLE

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VALVES

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This new association serves only to assure users of D. T. Williams Valves continued high quality and good service in the future as in the past. Direct orders and correspondence to D. T. Williams Valves, Detroit Controls Corp., 5801 Mariemont Ave., Cincinnati 27, Ohio.

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DETROIT CONTROLS
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American-Standard Products

RECENT TRADE LITERATURE

Continued

ing and ventilating systems in today's modern schools discussed, illustrated in nontechnical language in 16 page booklet F 7773. Literature covers control of convector systems, direct fired warm air systems, zone systems, unit ventilators and application of control centers for simplified installation, operation. *Barber-Colman Co., Dept. HPAC, Rockford, Ill.*

▶ *CONTROLS*—Literature discusses way to reduce automatic control cost on unit ventilator installations. Covers company's combination room and discharge thermostat for mounting within unit ventilator cabinet. *Barber-Colman Co., Dept. HPAC, Rockford, Ill.*

▶ *CONVERSION FACTORS*—Free wall chart includes such conversion factors as inches to centimeters or watts to horsepower as well as conversions difficult to locate in reference manuals, says company. *Precision Equipment Co., Dept. HPAC,* 3716 *N. Milwaukee Ave., Chicago* 41.

▶ *COOLANT SYSTEMS*—"Dual valve" control mist coolant systems detailed in bulletin 37-A. Controls permit separate adjustment of air supply and coolant, making it possible to vary coolant mixture from very fine mist to maximum discharge, says company. *Trico Fuse Mfg. Co., Dept. HPAC,* 2948 *N. Fifth St., Milwaukee* 12.

▶ *DAMPERS, LOUVERS*—New 8 page bulletin illustrates, describes line of dampers, louvers, sheet metal specialties for heating, ventilating, air conditioning systems. Contains dimensional drawings, specifications. *Imperial Damper Co., Dept. HPAC,* 664 *Edgecombe Ave., New York* 32.

▶ *DIFFUSERS*—New 80 page selection manual No. 60 on air diffusers for air conditioning, heating, venti-

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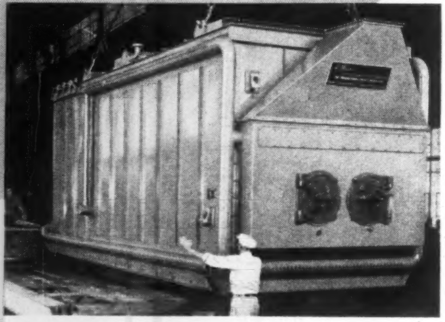
The Swing is to *International-LaMont* for HIGH TEMPERATURE WATER GENERATION

One of (2) 40,000,000 Btu./Hr. packaged HTW Generators being loaded for shipment to Johnson & Johnson, New Brunswick, N.J.



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including industrial, government, institutional and air terminal projects. Here is proof of the unequalled acceptance of International-LaMont Forced Recirculation Generators for the most efficient, lowest cost high temperature water for large area heating, power and process requirements—with these exclusive advantages:

- **NO THERMAL SHOCK** — System return water is circulated through the Built-In Economizer and brought close to saturated temperature by flue gases BEFORE reaching the radiant furnace zone.
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Steel Firebox Heating & Power Boilers Low & High Pressure Water Tube Package Boilers • International-LaMont Forced Recirculation Generators • ASME Code Pressure Vessels & Welded Products.

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RECENT TRADE LITERATURE

Continued

lating systems contains diagrams, tables, illustrations to aid in selection of diffusers, accessories for high velocity as well as conventional air conditioning systems. Included are air distribution definitions, sound level characteristics, static pressure factors, typical installations. *Anemostat Corp. of America, Dept. HPAC, 10 E. 39th St., New York 16.*

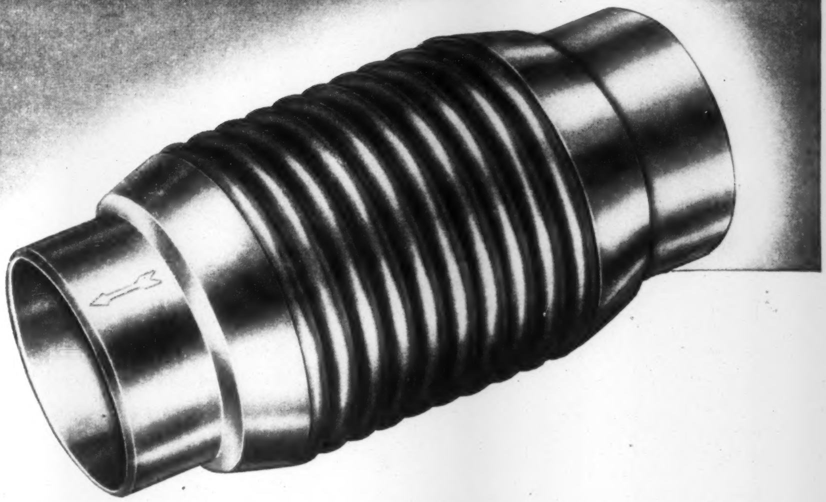
▶ *DUCT INSULATION*—Six page folder covers "Spintex" duct insulation. Deals specifically with insulation for air conditioning ducts. Cities high insulating value, fire safety, easy application of "Spintex." Gives physical and thermal property data, table of standard sizes and thicknesses and available facings. *Johns-Manville Corp., Dept. HPAC, 22 E. 40th St., New York 16.*

▶ *ELECTRONIC AIR CLEANERS*—Catalog No. E-82 covers line of electronic air cleaners for small commercial establishments. "Model 6" line includes eight models for capacities 1000 to 9600 cfm of air. *Trion, Inc., Dept. HPAC, 1000 Island Ave., McKees Rocks, Pa.*

▶ *EVAPORATIVE CONDENSERS*—Bulletin 234-G covers evaporative condensers for ammonia, fluorinated hydrocarbon refrigerant refrigerating systems. Discusses advantages, principle of operation, coil design, pumps and fans, assembled units, housing. Contains dimensional diagrams, tables for various sizes. *Frick Co., Dept. HPAC, Waynesboro, Pa.*

▶ *FANS, BLOWERS, EXHAUSTERS*—Bulletin No. 502 describes different heavy duty industrial fans, blowers, exhausters manufactured by company. Illustrates custom-built fans ready for service, units at work in various industries, various types of units including man cooling fans, tubeaxial fans, wall type ventilating fans, backward curved fans, exhausters, blowers. *Robinson Ventilating Co., Dept. HPAC, Zelienople, Pa.*

New MULTI-PLY EXPANSION JOINT gives greater ELASTICITY



Here's an expansion joint that's really different—it's the BOA expansion joint with the exclusive patented multi-ply corrugated element. Its greater elasticity, flexibility and longer life is the result of the superior cold-forming properties of extremely light-gage stainless steel strip. This "layer on layer" construction of the corrugated element resulting in low reaction to mechanical forces, permits greater responsiveness to expansion and contraction.

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Write today for detailed and descriptive literature.

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The BOA multi-ply is made in standard sizes ranging from 1 1/2" to 24" for pressures to 400 psi. Others specially engineered for higher pressures and temperatures.

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If you are a distributor or contractor, — ask us about some of the exclusive territories still open.

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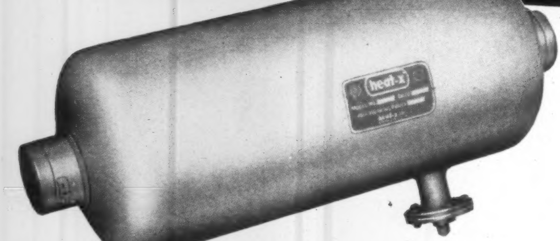
NOW
OIL SEPARATION AND
SYSTEM SILENCING
ENGINEERED INTO
A SINGLE UNIT



the HEAT-X 'OSM'
OIL SEPARATOR-MUFFLER

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Silencing is more than just *incidental* and *partial* with Heat-X 'OSM' Oil Separator-Mufflers. These units were *specifically engineered* to completely silence all system noises and absorb all pulsations from the compressor . . . *in addition* to separating entrained oil.

And these "all-in-one" units make float troubles a thing of the past. 'OSM' Oil Separator-Mufflers have *no floats* to hang open or stick closed. Instead, units incorporate a positive action Velocity Pressure Mechanism, *exclusive with Heat-X,* which opens only when compressor is running . . . closes of its own weight when compressor stops.

Ratings based on *tonnage,* not *horsepower,* permit close matching of unit to requirements . . . eliminate need to buy more than required capacity.

Ruggedly constructed to A.S.M.E. specifications. Available in capacities from 1 to 75 Tons F-12 and 1 to 100 Tons F-22.

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RECENT TRADE LITERATURE

Continued

▶ *FLEXIBLE AIR DUCT*—New 4 page circular 591 details various types of flexible air duct used for air conditioning, fume and dust exhaust, corrosive fumes. Photographs illustrate product versatility. *Wiremold Co., Dept. HPAC, Hartford 10, Conn.*

▶ *FLOW TUBE*—Two page bulletin describes, illustrates "Dall" flow tube for natural gas. Contains charts showing power savings. Covers secondary instruments required to convert differential head into rate of flow. *B-I-F Industries, Inc., Dept. HPAC, Providence, R.I.*

▶ *GAS WATER HEATING*—Eight page folder describes objectives, facilities, equipment, curriculum of Ruud Mfg. Co.'s Institute of Gas Water Heating Engineering. Booklet points out that institute training course is open to those working in commercial gas water heating field. *Ruud Mfg. Co., Dept. HPAC, Kalamazoo, Mich.*

▶ *GRILLES*—Lines of "Uni-Flo" air distribution grilles featured in 24 page catalog No. 1415-12. In addition to descriptive information and photographs of grilles, literature contains data on accessories. *Barber-Colman Co., Dept. HPAC, Rockford, Ill.*

▶ *HERMETIC CENTRIFUGAL REFRIGERATION UNIT*—Bulletin No. C-1100-B95 P contains information about component parts, features, specifications of new hermetic centrifugal refrigeration unit available in sizes 100 to 500 tons. Unit designed to meet any air conditioning installation requirement where chilled water is used. *Worthington Corp., Dept. HPAC, Harrison, N.J.*

▶ *HOSE CLAMPS, TOOLS, FITTINGS*—New 12 page catalog 300RG-56 is compilation of standard type hose clamps, grooved hose fittings, special tools and replacement parts. Literature also designed to serve as instruction and training manual. *Punch-Lok Co., Dept. HPAC, 321 N. Justine St., Chicago 7.*

▶ *HOSE COUPLINGS*—Heavy duty, high pressure hose couplings described, illustrated in bulletin No. 115. Literature covers applications of high pressure air, steam, gas, hydraulics, other fluids. *Le-Hi Div., Hose Accessories Co., Dept. HPAC, 2704 N. 17th St., Philadelphia 32.*

▶ *HUMIDIFICATION*—Bulletin 82 illustrates, describes nozzles, nozzle assemblies, float boxes, humidistats, solenoid operated valves, other required components of industrial humidifying system. Included is information on compact units designed for easy installation in smaller plant rooms. *Spraying Systems Co., Dept. HPAC, 3201 Randolph St., Bellwood, Ill.*

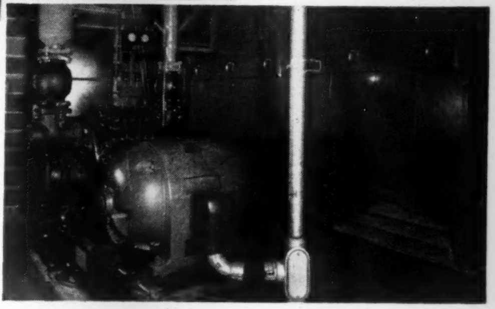
▶ *INDICATING PNEUMATIC CONTROLLERS*—Catalog C(600/-700)1 describes small case indicating pneumatic controllers for temperature, pressure. Units available in number of temperature ranges between zero and 1000 F, pressure ranges zero to 1000 psi. *Minneapolis-Honeywell Regulator Co., Industrial Div., Dept. HPAC, Wayne and Windrim Aves., Philadelphia 44.*

▶ *INDUCED DRAFT FANS*—Engineering data sheets for "Quickdraft" units available from manufacturer. Tabular information includes capacities, dimensions, motor ratings, blower diameters, shipping weights. Separate price list also available. *Quickdraft Co., Dept. HPAC, Canton, Ohio.*

▶ *INDUSTRIAL LUBRICATION, ACCESSORIES*—New 32 page catalog 403 features automatic and air powered industrial lubricating equip-

Jewish
Old People's
Home
KANSAS CITY, MISSOURI
. . . decides
on Vilter

▲ The attractive modern decor of this restful lounge is in keeping with today's trend towards comfortable homes for the old folks.



The Vilter 8-cylinder Freon VMC compressor used in this installation. Reliable performance has won Vilter wide acceptance in commercial air conditioning of all kinds. ▶

Q. How can one provide that extra something for our older folks?

A. Install reliable Vilter® AIR CONDITIONING to insure maximum comfort—equipment which

costs less to own*

In this Jewish Old People's Home at Kansas City, Missouri, Vilter air conditioning plays an important role in the drama of life . . . providing modern comfort and pleasant leisure for older people during their golden years. Here, as elsewhere, Vilter prides itself in a job well-engineered, carefully installed, utilizing air conditioning equipment noted for economical operation and long life . . . important considerations in community service organizations operating homes on fixed incomes.

In this Home, Vilter equipment includes a Freon VMC compressor with a step down control to reduce refrigeration capacity by 25%, 50%, or 75% of full rated load, and which makes for greater economy of operation. Vilter VMC's are known for their smooth, dependable operation and efficient performance.

It will be good business for you to see your nearest Vilter engineer for a careful evaluation of your air conditioning and refrigeration needs for all types of offices, clubs, schools, and commercial buildings.

Sold and installed by O'Dower Engineering Company, Kansas City, Missouri

* Savings in low first cost are not the complete answer when considering the installation of refrigeration equipment. But savings in terms of years of extra service, reliable performance and minimum maintenance—that's where Vilter excels in low-cost ownership.

Vilter®

QUALITY CRAFTSMANSHIP that lasts . . .
ENGINEERING DESIGN that guarantees performance

REFRIGERATION and AIR CONDITIONING

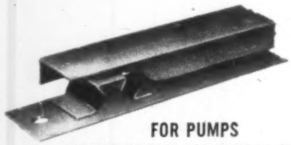
THE VILTER MANUFACTURING COMPANY, Milwaukee 7, Wisconsin
Air Units • Ammonia & Freon Compressors • Booster Compressors • Baudelot Coolers • Water & Brine Coolers • Blast Freezers • Evaporative & Shell & Tube Condensers • Pipe Coils • Valves & Fittings • Pakice & Polarflake Ice Machines

HOW TO ISOLATE VIBRATION IN AIR CONDITIONING SYSTEMS

Here are eight practical solutions to your vibration problems

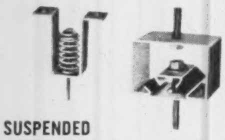
FOR ALL-PURPOSE USE

These rubber-in-shear vibration mountings are widely used for isolating vibration and noise on air conditioning equipment. Shipped complete, ready to use, their rated load is from 40 to 4000 lbs. Catalog RS-55.



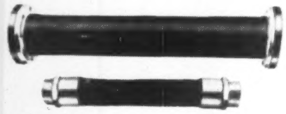
FOR PUMPS COMPRESSORS, FAN-MOTOR SETS

Floating Rail vibration mountings have rubber-in-shear isolators. Rails are tapped and drilled to specification. Bases made for fan-motor sets are shipped complete, ready for installation. Catalog FR-55.



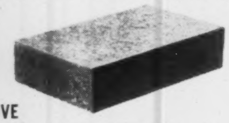
FOR SUSPENDED EQUIPMENT AND PIPING SYSTEMS

Two types of vibration hangers are available: rubber-in-shear (load range: 35 to 1500 lbs.), and steel spring (50 to 1400 lbs.). Both are extremely effective in preventing transmission of vibration from suspended equipment and piping systems. Catalog VH-55.



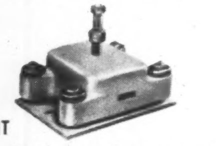
FOR WATER LINES

The original SOUNDZORBER. Wire-reinforced, wrapped-fabric, rubber pipe widely used for reduction of water line noise and vibration. Working pressures up to 250 psi. Sizes: ½ to 14" ID with I.P.T. male fittings or with full-faced rubber flanges backed up with Series 15 or 30 steel flanges. Catalog SZ-55.



FOR MASSIVE DIFFICULT-TO-ISOLATE EQUIPMENT

ISOLANT is an unusually strong and resilient material which provides excellent isolation of vibration, shock and noise. It is particularly suited for massive air conditioning equipment and similar machinery. Load range: up to 6000 lb. per sq. ft. Catalog IS-55.



FOR HEAVY EQUIPMENT

Steel Spring vibration mountings offer maximum vibration, shock and noise isolation of difficult-to-isolate low-speed machinery, heavy air conditioning equipment, and delicate instruments. Load range: from 100 to 6500 lbs. Catalog SS-55.

FOR FREON LINES

FLEXZORBER, a seamless flexible bronze tubing covered with woven wire braiding, is used to minimize vibration and noise in air conditioning and refrigeration freon lines. Standard copper tube female "slip fittings," welded on both ends, are available from ⅛" to 8" ID. Catalog FZ-55.

FOR STEAM AIR AND GAS LINES

EXPANDZORBER is a stainless steel, welded-diaphragm-type, packless expansion joint used for control of vibration, expansion and contraction in steam, chemical, oil and gas lines. Working pressure from vacuum to 1000 psi at −300 to +1800F. Sizes: ½" to 24" with steel flange or weld end fittings. Catalog EZ-55.

For complete catalog information, write—

FINN

T. R. Finn & Company, Inc., Industrial Division
200 Central Avenue, Hawthorne, New Jersey

VIBRATION FINNFLEX CONTROL

Industry's most complete line of shock and vibration controls

RECENT TRADE LITERATURE

Continued

ment, paint and mastic spray units, accessories. Illustrates, describes automatic "Gun-Fil" bearing lubricators, line of industrial hand and air powered lubrication equipment including new "Fire-Ball" series high pressure lubrication supply pumps. *Gray Co., Inc., Dept. HPAC, 1039 Sibley St., N.E., Minneapolis 13.*

▶ *LIQUID CHILLERS*—Form AC-233, 16 pages, illustrates and contains specification data on company's "SW Series" of sealed, water cooled, packaged liquid chillers rated 3 to 30 tons. Explains chiller, condenser and compressor construction. Describes control panel features. Contains electrical capacity and water pressure drop data. *Airtemp Div., Chrysler Corp., Dept. HPAC, 1600 Webster St., Dayton 1.*

▶ *LIQUID CHILLERS*—Direct expansion shell and tube liquid chillers in sizes 2 to 200 tons described, illustrated in 20 page bulletin No. LC-2. Contains capacity rating tables for fluorinated hydrocarbon refrigerants Nos. 12 and 22. Includes dimensional drawings with tables. *Kennard Corp., Dept. HPAC, 1819 S. Hanley Rd., St. Louis 17.*

▶ *LIQUID METER*—Direct reading, propeller type liquid meter covered in 2 page bulletin. Contains illustrations, list of features, accuracy curves, table of flow ranges. *B-I-F Industries, Inc., Dept. HPAC, Providence, R.I.*

▶ *MECHANICAL PACKINGS*—New 4 page folder lists mechanical packings used on applications in industrial, power, processing plants. Each packing illustrated, accompanied by brief description. *Flexrock Co., Dept. HPAC, 3603-K Filbert St., Philadelphia 1.*

▶ *METERS*—How "Shuntflo" meters are installed in gas lines to drying ovens of paint spray booths in automobile assembly plant described in 2 page bulletin. Literature lists features, applications, accuracy and range. *B-I-F Industries, Inc., Dept. HPAC, Providence, R.I.*

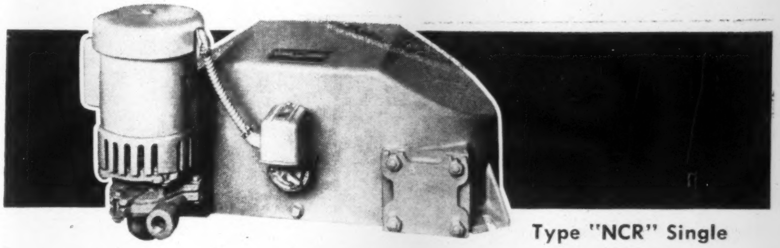
▶ *METERS, REGULATORS, VALVES*—Revised condensed 28 page bulletin No. C-5000 covers meters, regulators, valves. Featured in catalog are descriptions of recently introduced "telapilot"—with power pilot loading by remote control—and "Hypregun" valve lubricant gun. *Rockwell Mfg. Co., Dept. HPAC, 400 N. Lexington Ave., Pittsburgh 8.*

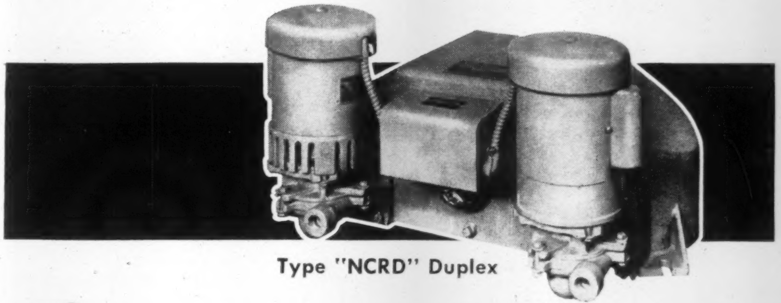
▶ *NOISE CONTROL*—*How to Control Industrial Noise* is title of 20 page brochure. Covered are: background data in acoustics; acoustical treatment, sound absorbers inside plant; outdoor noise problems and their solution. *DeBothezat Fans Div., American Machine and Metals, Inc., Dept. HPAC, East Moline, Ill.*

▶ *PIPE NIPPLES*—Catalog covers company's program for identifying seamless steel, wrought iron, certain welded steel pipe nipples by means of roll indented markings and color tints. Markings denote type of material, ASTM specification, weight or schedule number, grade. *Pittsburgh Nipple Works, Inc., Dept. HPAC, 1455 Spring Garden Ave., Pittsburgh.*

▶ *PRESSURE TRANSMITTER*—Specification S705-1 describes nonindicating pneumatic pressure transmitter for vacuum or pressure measurement. Using spiral or spring and bellows primary element, will measure and transmit pressures zero to 90 in. WG to zero to 4000 psi. *Minneapolis-Honeywell Regulator Co., Industrial Div., Dept. HPAC, Wayne and Windrim Aves., Philadelphia 44.*

▶ *RADIAL COMPRESSORS*—Form AC-249, 38 pages, illustrates and contains feature and specification information on 10 to 125 hp line of





Type "NCR" Single

Type "NCRD" Duplex

7 Important Advantages in WHEELER-ECONOMY Condensate Return Pumps

For ratings up to 8,000 Sq. Ft. E.D.R. at 50 psi

1 Close-Coupled Pump with Mechanical Seal • Pump flanged directly to receiver • Water flows from tank to pump without passing through any piping.
2 Low Inlet • Only 7½" above floor • Simplifies installation • Keeps piping out of way.
3 Single Unit can be converted to Duplex Unit • Simply remove blind flange and add a pump, motor and mechanical alternator.
4 Float Control features External Adjustment for limiting operational levels of condensate within receiver.
5 Single Unit is operated by a float switch. Duplex Unit features a mechanical alternator which alternates operation of pumps, provides emergency operation of one pump should the other be inoperable and simultaneous operation of both pumps under peak flow conditions.
6 Easily Serviced • Can be taken apart quickly without disturbing pipe connections.
7 Self-Venting • Oversize Suction inlet permits pump to handle condensate at 200° F without vapor locking.

40 YEARS REPUTATION

Today's Wheeler-Economy Heating System Pumps are backed by 40 years of high performance in thousands of installations.

Write for Catalog H-1.

C. H. WHEELER MANUFACTURING CO., ECONOMY PUMP DIVISION
19th & Lehigh, Philadelphia 32, Pa.

WE 700

C.H. Wheeler
OF PHILADELPHIA

REACH All

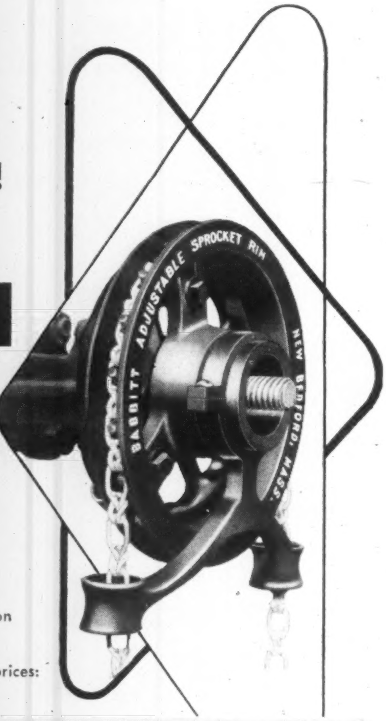
Overhead Valves without DANGER!

REACH for

Babbitt

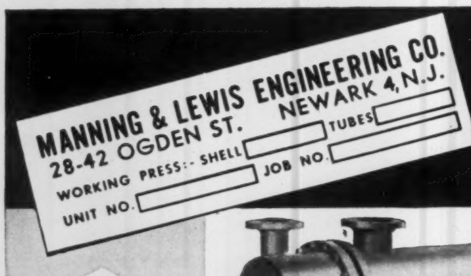
Adjustable
SPROCKET RIM
with Chain Guide

- Eliminate dangerous catwalks, ladders, balconies, boxes, stools, etc.
- Prevent accidents, protect personnel
- Reach inaccessible areas easily
- Operate every valve from plant floor
- Easy to install and operate
- No maintenance; first cost, only cost
- Easy instructions with each unit
- Packed, completely assembled, one to a carton
- Fits any size valve wheel
- Your supplier carries complete stock
- Write for new descriptive Catalog sheet and prices:



Babbitt STEAM SPECIALTY CO.

8 BABBITT SQUARE, NEW BEDFORD, MASS., U.S.A.


MANNING & LEWIS ENGINEERING CO.
28-42 OGDEN ST. NEWARK 4, N.J.
WORKING PRESS:- SHELL
TUBES
UNIT NO.
JOB NO.

FUEL OIL HEATERS WATER HEATERS and COOLERS

THIS NAMEPLATE IS YOUR GUARANTEE OF QUALITY

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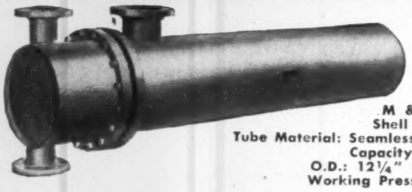
Heat Exchangers
Condensate Coolers
Heating Elements
Converters
Tank Heaters
Tankless Water Heaters
Instantaneous Water Heaters



M & L CONVERTER
Shell Material: Steel
Tube Material: Seamless Drawn Copper
Capacity: 13,200 g.p.h.
O.D.: 12¼" Length: 106½"
Working Pressure: 150 P.S.I.

The above unit is one of several M & L Converters now installed at Idlewild Airport in New York. They were designed and fabricated to furnish the heating system of a hangar with water at 140°F.

In order to meet exact specifications, minor changes were made in standard M & L Converters and one more successful installation went into the record.

Our long proven ability to design for a specific need has been extremely helpful in thousands of successful installations all over the country. This service is as near to you as your telephone.

For further details send for your copy of bulletin 780, or we will be happy to send a representative to assist you with any heating or cooling problem.

Manning & Lewis *Engineering Company*
DESIGNERS & MANUFACTURERS OF QUALITY HEAT EXCHANGE EQUIPMENT
28-42 OGDEN STREET NEWARK 4, NEW JERSEY

M&L

radial compressors designed for commercial, industrial air conditioning and refrigeration. Compressor design, components, controls, operation pictured and explained. *Airtemp Div., Chrysler Corp., Dept. HPAC, 1600 Webster St., Dayton* 1.

▶ *RECESSED ROOM AIR CONDITIONER*—"Model 920" recessed room air conditioner for hotels, apartments, hospitals, motels, office buildings, schools covered in 4 page bulletin. Folder contains cutaway illustration showing component parts. Includes description of architectural specifications, unit specifications, roughing-in data. *Mueller Climatrol, Dept. HPAC,* 2005 *W. Oklahoma Ave., Milwaukee* 15.

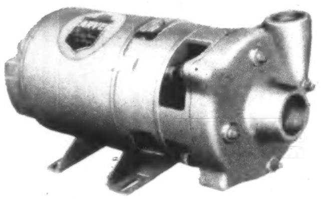
▶ *REGULATORS, TIME SWITCHES*—How to automatically control building temperatures from outdoors described in 4 page bulletin No. P-257. Covers company's line of "Weather-Man" and "Weather-Chron" regulators and time switches. Included with descriptions, specifications of various regulators is chart which recommends type of control to be used under varying conditions. *Automatic Devices Co., Inc., Dept. HPAC,* 714 *Hillgrove Ave., Western Springs, Ill.*

▶ *SCREW CONVEYOR DRIVES*—Catalog SCD-57, 8 pages, covers recently introduced line of shaft-mounted "Screw-King" speed reducers for screw conveyor application. Literature designed to simplify selection for specific applications. *American Pulley Co., Dept. HPAC,* 4201 *Wissahickon Ave., Philadelphia.*

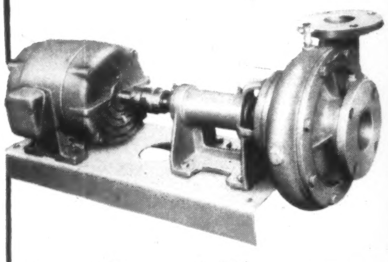
▶ *SELECTOR VALVES*—Catalog No. 356, 4 pages, covers "Seal-Tite" selector valves. Includes description, cutaway illustration, dimensions, specifications. Units available for two-, three-, four-way service in sizes ⅛ to 1 in. *Republic Mfg. Co., Dept.*

CARVER MODEL B PUMPS

. . . the Air Conditioning Pumps primed with Extra Values . . . your best buy for Cooling Towers, Chill Water Circulation and Hot Water Heating Systems.



Choose from CARVER'S complete line of reliable, versatile pumping units that feature Quiet, Vibration-Free Operation, Maximum Performance, Efficiency and Economy.



Carver *close-coupled* Electro-pumps as well as Carver *base-mounted* Pumps are available in all sizes with capacities up to 1000 G.P.M. and heads up to 240 feet.

Excellent as original equipment. Modern in design, pleasing in appearance, they add the final touch to fine equipment.

CARVER PUMP COMPANY
1460 Hershey Ave.
Muscatine, Iowa

CARVER

the quality name in pumps

RECENT TRADE LITERATURE

Continued

HPAC, 15655 Brookpark Rd., Cleveland 11.

▶ *SPACE HEATER*—"Waikiki" space heater, designed to deliver 200,000 Btu per hr automatically, covered in bulletin No. 445. Literature lists features, specifications. Units available in vertical type with power burner, horizontal type with power burner, vertical type with aspirated burner. *Vapor Heating Corp., Dept. HPAC, 80 E. Jackson Blvd., Chicago 4.*

▶ *SPACE HEATERS*—New 16 page brochure details "Counterflo" space heaters with induced draft "Pyrojet" dual fuel burners. Includes two-page cutaway illustration showing and describing component parts. Contains dimensional drawings, tables of dimensions, engineering data, burner options. *Dravo Corp., Dept. HPAC, Dravo Bldg., Pittsburgh 22.*

▶ *STAINLESS STEEL*—Forty page manual contains information on approved techniques for fabricating stainless steel. Literature recommended by company to shops, manufacturers who work in stainless steel. *Republic Steel Corp., Dept. HPAC, 3100 E. 45th St., Cleveland.*

▶ *STAINLESS TUBING*—Designed to aid engineers, other involved in problems of corrosion and high temperature services, technical data letters ASL No. 285 and ASL No. 286 offer data on "Croloy 27-4-1" and "Croloy 25-12" in tubular form. *Babcock & Wilcox Co., Tubular Products Div., Dept. HPAC, Beaver Falls, Pa.*

▶ *STEAM PRESSURE VALVE*—"Type 44" pilot operated pressure reducing and regulating valve described in bulletin No. 981. Information includes photograph and cross-sectional diagram, specifica-

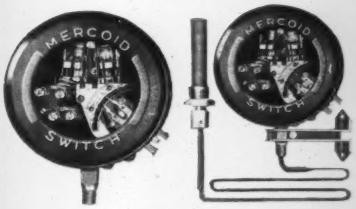
DO YOU HAVE A TWO-STAGE PRESSURE OR TEMPERATURE CONTROL PROBLEM

MERCOID® HAS THE SOLUTION

Mercoid DA-400 Series Controls are dual purpose controls (available for pressure or temperature) incorporating a single element operating two separate independently adjustable Mercoid magnetic mercury switches. Circuit arrangements can be supplied for various operations, a few examples are:

1. *Close one alarm circuit at high setting and a separate circuit at low setting. Both circuits remain open between the high and low operating points of the two switches.*
2. *As an electrical interlock to open one circuit on a rise above, and the second circuit on a drop below the set operating point.*
3. *To provide two-stage control by opening one circuit on a rise and a second circuit on a further rise.*

***Pressure types* available in 17 different operating ranges from 0-30" vac. to 300-2500 psi. *Temperature types* available in 11 operating ranges from -30-60°F. to 370-530°F.**



All types are equipped with external adjustments and visible calibrated dial.

Our engineers are at your service—send in your control problem or WRITE FOR BULLETIN CA-PT

THE MERCOID CORPORATION
4211 Belmont Ave., Chicago 41, Ill.

WHO'S WHAT . . .

(New personnel, promotions)

▶ *AMERICAN RADIATOR & STANDARD SANITARY CORP.*—John C. Linsenmeyer, executive vice president, operations; John W. Brennan, president of American Blower Div.; Richard S. Reade, president of Ross Heat Exchanger Div. Additional American Blower appointments are: R. L. Bernhard, vice president, engineering; W. A. Gardner, vice president, manufacturing.

▶ *KROESCHELL ENGINEERING CO.*—Robert A. Kroeschell, chairman of the board of the Chicago air conditioning, refrigeration and heating contracting firm. He succeeds Arnold H. Goelz, who will continue as treasurer and director.

▶ *BABCOCK & WILCOX CO.*—New assignments within reorganized manufacturing department of company's boiler division include: C. J. Hartnett, Jr., manager of industrial engineering section in charge of all planning functions for all plants of the department; G. A. Profita, general superintendent in charge of manufacturing for all boiler division plants; G. F. McDermott, Barberton, Ohio, works superintendent.

▶ *YORK DIV., BORG-WARNER CORP.*—Austin Rising, vice president in charge of marketing services; George R. Metzdorf, director of manufacturing services.

▶ *AMERICAN INSTITUTE OF CONSULTING ENGINEERS*—Edward H. Anson, president. Mr. Anson is senior vice president and director, Gibbs & Hill, Inc., New York. Elected council members are: E. Sherman Chase, Metcalf & Eddy, Boston; Dean G. Edwards, Edwards, Kelcey and Beck, Newark; Emil H. Praeger, Praeger & Kavanagh, New York.

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▶ *REMINGTON CORP.*—Andrew F. Reiss, director of engineering; John R. LaCasse, treasurer.

with
WEINMAN
PUMPS too . . .

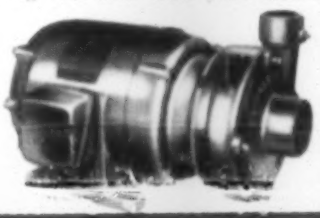
TOP
PERFORMANCE
COUNTS!

The ability to turn in an outstanding performance every time . . . to come through a winner when the going is toughest . . . that's the mark of a top-flight tournament golfer.

And it's this ability for outstanding performances that makes WEINMAN Close-Coupled AC Pumps so great. You know that here's a pump that will outperform all others, year after year. Economical to buy, operate and maintain, WEINMAN Type AC Pumps are real space savers, too. Compact and powerful, they can be mounted in any desired position. What's more, they'll give you consistent leakless operation, even when handling water containing abrasive dust.

No matter how specialized your need for a circulating pump . . . for air conditioning systems, cooling tower circulation, hot or chilled water circulation, booster service or general pumping needs . . . you'll find the right pump for your needs in WEINMAN'S big AC line. Call your nearest WEINMAN Pump Specialist for help in solving your pump problems. He's listed in the yellow pages of your telephone book.

Write for free literature on the complete line of WEINMAN AC Pumps



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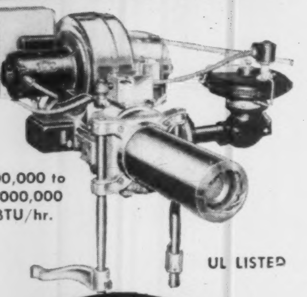
SUPERIOR?
CERTAINLY!



GAS

syncro flame

GAS

NEW POWER GAS BURNER FILLS IMPORTANT NEEDS

Be *sure* you know about SYNCRO/FLAME whenever you have a job that calls for a good forced-draft gas burner! This one is designed for boilers in the range of 10 to 150 h.p. It comes in seven sizes, of different capacities, and it is outstanding for unusual and valuable features. Among them are . . .

NON-PULSATING FLAME
EXPLOSION-FREE CIRCUIT

Adept engineering has achieved a flame that positively does *not pulsate* on starting or stopping, thus completely removing a common objection. Also, a new control circuit virtually eliminates *any* chance of explosion, even under conditions of bad misadjustment. Circuits are also provided for pre-purge, post-purge, and graduated light-off. *Certainly* — a *great* power gas burner!

WRITE FOR LITERATURE

Write today for circular describing all features and giving full specifications. Ask for Bulletin 553.

MANUFACTURERS OF OIL AND GAS AND OIL/GAS BURNERS
SYNCHRONOUS FLAME, INC.
WALWORTH • WISCONSIN

RECENT TRADE LITERATURE
Continued

tions, pressure and temperature ratings, capacity chart, installation instructions, other data. *A. W. Cash Co., Dept. HPAC, P.O. Box 551, Decatur, Ill.*

▶ *STEEL*—*High-Temperature Problems in Process Plants* is title of 8 page reprint TR-544. Literature discusses use of steel, its various alloys, and mechanical and physical reactions of the materials under various temperature and corrosive environments. *Babcock & Wilcox Co., Tubular Products Div., Dept. HPAC, Beaver Falls, Pa.*

▶ *SULPHURIC ACID DISPENSER*—"66° Baume" sulphuric acid dispenser, designed as safeguard in handling this hazardous chemical, described and illustrated in 2 page application memo B-I-F P-3. *Proportioneers, Inc., Div. of B-I-F Industries, Inc., Dept. HPAC, Providence, R.I.*

▶ *THERMOCOUPLES*—Specification S001-6 describes spring loaded thermocouples designed for applications where pressure contact is required for efficient temperature measurement. *Minneapolis-Honeywell Regulator Co., Industrial Div., Dept. HPAC, Wayne and Windrim Aves., Philadelphia 44.*

▶ *TUBING*—"Teflon" thin-walled tubing is subject of 2 page bulletin T-200. Literature stresses "Teflon's" range of electrical properties, resistance to chemical attack. Bulletin charts diameters, wall thicknesses and tolerances, weights of standard tubing sizes. *Haveg Industries, Inc., Dept. HPAC, 900 Greenbank Rd., Wilmington 8, Del.*

▶ *TUBING*—Twelve page brochure No. 756 covers company's line of electric welded steel tubing. Discusses various types, fabricating and finishing operations. *Nikoh Tube Co., Dept. HPAC, 5000 S. Whipple St., Chicago 32.*

‡

ATTENTION CHICAGO!

Chicagoan decapitates Mr. Entropy* — stops steam waste with SELECTOTHERM

Around Chicago, Clint Pickett, 2035 Racine Avenue, is famed for eliminating steam waste in schools and other buildings where boilers are used for steam heating.

He does it with SELECTOTHERM, the high-vacuum heating system that automatically provides steam at the proper pressure and temperature for perfect comfort. Installation records show that SELECTOTHERM cuts the fuel bill 19% or more — *enough to pay for the system within five years!*

SELECTOTHERM applies the control directly to the boiler, adds to the effectiveness of unit ventilators and individual room control. Get the whole story. If you're from the Chicago area, call Clint at Illinois Engineering Company (CA 6-6430). If not, write for fact-filled SELECTOTHERM booklet, *Boiler Room Ballad.*

* *Mr. Entropy represents the heat that is produced but unavailable for use.*

SELECTOTHERM
HEATING CONTROL SYSTEM ®

A product of Illinois Engineering Co.
Division of American Air Filter Co., Inc.
2035 South Racine Ave., Chicago 8

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▶ *WARNER ELECTRIC BRAKE & CLUTCH CO.*—Norman K. Anderson, vice president and general manager of industrial division; King DeSeve, vice president and general manager of automotive division.

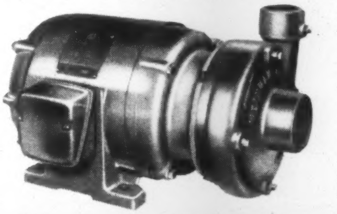
with WEINMAN PUMPS too . . .

TOP PERFORMANCE COUNTS!

The ability to turn in an outstanding performance every time . . . to come through a winner when the going is toughest . . . that's the mark of a top-flight tournament golfer.

And it's this ability for outstanding performances that makes WEINMAN Close-Coupled AC Pumps so great. You know that here's a pump that will outperform all others, year after year. Economical to buy, operate and maintain, WEINMAN Type AC Pumps are real space savers, too. Compact and powerful, they can be mounted in any desired position. What's more, they'll give you consistent leakless operation, even when handling water containing abrasive dust.

No matter how specialized your need for a circulating pump . . . for air conditioning systems, cooling tower circulation, hot or chilled water circulation, booster service or general pumping needs . . . you'll find the right pump for your needs in WEINMAN'S big AC line. Call your nearest WEINMAN Pump Specialist for help in solving your pump problems. He's listed in the yellow pages of your telephone book.



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THE WEINMAN PUMP MFG. CO.
290 SPRUCE ST. COLUMBUS 8, OHIO

CORROSIVE GASES
CHEMICAL FUMES
DUST
LIGHTWEIGHT PARTICLES
SMOKE
VAPORS
CELLOPHANE CUTTINGS
Quickdraft...

THE WORLD'S MOST EFFICIENT POWER EXHAUSTER

...for industry...for institutions...for residences

★ NO MOTORS, FANS OR BEARINGS IN EXHAUST LINE
★ NEEDS NO STACKS ★ ACID RESISTING VITREOUS ENAMEL FINISH

FOR INDUSTRY, Quickdraft excels in venting paint booths . . . abrasives . . . corrosive gases . . . noxious fumes . . . high temperatures and moisture. Its blower operates in clean or outside air. It eliminates down-time for cleaning and replacing fan blades. It improves industrial venting and reduces maintenance costs!

FOR INSTITUTIONAL AND COMMERCIAL BUILDINGS, Quickdraft efficiently vents heating plants, water heaters and incinerators at roof level. It saves the cost of building unsightly tall stacks.

FOR RESIDENCES, Quickdraft makes low, cold and erratic chimneys function. On and off with the fire, Quickdraft maintains constant draft required for efficient and economical combustion of all fuels. It eliminates pulsating or chattering, puffing, smoking and sooting.

SEND FOR QUICKDRAFT ENGINEERING DATA ON YOUR VENTING OR HEATING APPLICATIONS . . . TODAY.

Capacities of 56 standard and heavy duty models (6 to 30 inches diameter) . . . 8,400 CFH to 1,005,960 CFH . . . greater capacities on special order.

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P.O. Box 87-K Dueber-Hampden Bldg., Canton 1, Ohio
Please send Quickdraft engineering data for
☐ Industrial Exhausting
☐ Commercial Heating Plant
☐ Residential Heating Plant

Firm ____________________
Individual ______________ Title ______
Street __________________
City ____________ Zone ___ State ______

WHO'S WHAT

Continued

▶ *AMERICAN GAS ASSOCIATION*—Harold S. Walker, Jr., secretary; Vaughan O'Brien, secretary of general management section, the post held by Mr. Walker prior to his appointment as secretary of the association.

▶ *ROCKWELL MFG. CO.*—W. Thomas Gettig, assistant to vice president in charge of meter and valve division; Elton H. Sellers, works manager of Barberton, Ohio, valve plant; Marshall G. Cook, assistant product manager, liquefied petroleum gas products; Herbert M. Logan, manager of distributor sales. Mr. Logan has been succeeded as Tulsa district manager by Orville W. Barnett.

▶ *CRANE CO.*—Frank E. Dameron, assistant directing engineer of heating and air conditioning department; Myer Evanson, coordinator of commercial heating.

▶ *TORRINGTON MFG. CO.*—Kenneth A. Merz, assistant chief engineer of air impeller division.

▶ *ACME INDUSTRIES, INC.*—Walter M. Hassenplug, vice president, director of engineering.

▶ *WORTHINGTON CORP.*—George W. Hartwell, chief engineer, commercial refrigeration equipment, at Holyoke, Mass., division.

▶ *PITTSBURGH CORNING CORP.*—Russell Brittingham, president. He succeeds H. B. Higgins, who is chairman of the board of Pittsburgh Plate Glass Co.

▶ *ROBERTSHAW-FULTON CONTROLS CO.*—Walter F. Rockwell and Woodford D. Miller, directors; John R. Robertshaw, Jr., a vice president.

▶ *BELL & GOSSETT CO.*—William G. Carlisle, training and education manager.

▶ *WEINMAN PUMP MFG. CO.*—Harvey R. Ray, secretary; Robert F. Hess, assistant treasurer. Mr. Ray, sales manager, was also elected a director in addition to being named as new company officer.

▶ *FAIRBANKS, MORSE & CO.*—P. R. Flood, general manager of Beloit, Wis., works; W. P. McAnally, manager of Pomona, Calif., works; C. H. Johnson, general manager of Stuttgart, Ark., works.

WHO'S WHAT

Continued

▶ *INTERNATIONAL NICKEL CO. OF CANADA, LTD.*—Ralph D. Parker, a director; J. Roy Gordon, executive vice president.

▶ *EMERSON ELECTRIC MFG. CO.*—Dr. Oliver G. Haywood, vice president and manager of company's Electronics and Avionics Div.

▶ *CONOFLOW CORP.*—J. Robert Simpson, III, sales manager.

▶ *C. H. WHEELER MFG. CO.*—Robert J. Benwell, manager of Wheelerweld Div.

▶ *JOHN WOOD CO.*—Dr. Stuart F. Faunce, director of new product development.

▶ *RUSSELL, BURDSALL & WARD NUT AND BOLT CO.*—Duke A. Garrison and Frederick E. Graves, appointed to new technical sales posts as assistants to vice president in charge of engineering and research.

▶ *FARRIS ENGINEERING CORP.*—Wilfred McGregor, divisional sales manager for Farris Engineering and also for Farris Flexible Valve Corp., an affiliate.

▶ *PHILCO CORP.*—Henry F. Argento, vice president and general manager, government and industrial division.

▶ *GRAVER WATER CONDITIONING CO.*—Vincent J. Calise, general sales manager.

▶ *RECONY CORP.*—Donald D. Stover, chief development engineer.

▶ *RUBEROID CO.*—LeRoy A. Peterson, a director.

▶ *CRANE CO.*—David H. McClain, administrative assistant of company's branch house division; Frank G. Johnson, auditor, succeeding Mr. McClain.

▶ *DAY & NIGHT MFG. CO.*—Frank R. Spratt, assistant general sales manager. He is replaced in his former post as California regional sales manager by Craig Stirewalt.

NOW! ...for combined heating-cooling systems

CEILING AIR DIFFUSERS
Flush or extended models, also dampers and installation rings
...custom comfort for every room
NO. 551 PERIMETER WALL REGISTERS
Fractionator volume control; complete 360° air diffusion.
NEW!
B-24 PERIMETER BASEBOARD DIFFUSERS
Adjustamatic finger-tip damper control; built-in damper.
PH SERIES PERIMETER FLOOR REGISTERS
Dialamatic control; set screw for easy balancing

...with this complete line of Standard Stamping Registers!

These four Standard Stamping Registers enable you to select the air pattern best suited to the size, shape, and use of every room served by a combined heating-cooling system. They're easier to install, trouble free, and give every two-way system perfect air distribution without blasts, hot spots or cold corners! Get the facts about them now!

MAIL THE COUPON NOW FOR FREE LITERATURE!

STANDARD Stamping & Perforating Company
3125 W. 49th Place, Chicago 32, Illinois

Gentlemen: Please send me your Registers and Grilles Catalog.

Name__________

Company__________

Address__________

City__________ Zone____ State____

WHO'S WHAT

Continued

▶ *HUPP CORP.*—David R. Lester, vice president in charge of human relations.

▶ *ALPHA PLASTICS, INC.*—Thomas F. Long, vice president in charge of sales.

▶ *HUTSON DIV., GIBSON-HOMANS CO.*—Martin F. Hurst, president and treasurer; W. R. Hutson, vice president and secretary.

▶ *A. M. BYERS CO.*—R. A. Evans, assigned to engineering service department.

▶ *ARMSTRONG CORK CO.*—Edgar B. Sterrett, Jr., assistant manager of promotion and sales training.

▶ *ACME INDUSTRIES, INC.*—Kenneth E. Ultsch and Hrant H. Yousoufian, sales engineers in OEM Sales Div.

▶ *SPI-ROL-FIN CORP.*—Martin B. Beline, vice president.

▶ *H. D. CONKEY & CO.*—H. C. Galleher, advertising manager.

▶ *JAMES B. CLOW & SONS, INC.*—Robert C. McAdam, assistant general manager of jobbing division. He will continue his former duties as sales promotion manager for the company.

▶ *DRAYER-HANSON, DIV. OF NATIONAL-U.S. RADIATOR CORP.*—Bill Keichline, assistant sales manager; Roy Graser, sales application engineer, succeeding Mr. Keichline.

▶ *PERMAGLAS DIV., A. O. SMITH CORP.*—W. T. Halket, general sales manager of water heating products; J. W. Burleson, general sales manager of heating and air conditioning products.

▶ *O. A. SUTTON CORP., INC.*—Bruce W. Reid, manager of field service; Charles V. Fisher, commercial products division sales manager.

▶ *BETZ DIV., BOHN ALUMINUM & BRASS CORP.*—Russell E. Keller, sales manager of industrial air conditioning; Robert W. Carvell, sales manager of commercial sales; Charles B. Simison, application en-

Dependable quality since 1863 . . . . .

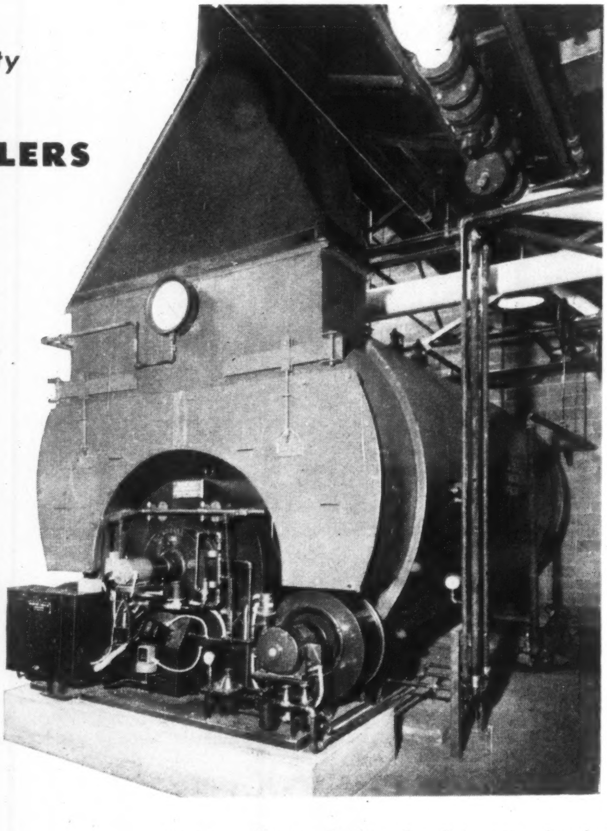
BISON

POWER BOILERS

Throughout 93 years, Farrar & Trefts has been a leader in boiler design and construction. Today, as in yesteryear, F & T offers dependable, efficient, modern power boilers to satisfy the ever-increasing demands of institutional, apartment, office and industrial buildings. Under the same BISON brand, F & T also furnishes low-pressure boilers for heating purposes.

Proper selection of a boiler for the continuous delivery of required heat and power is a precise project, demanding the systematic approach of engineers long trained in this work. Engineers at F & T have this background of service and they welcome opportunities to evaluate the needs of boiler users.

Standard F & T Super Scot Power Boiler (150 lb. design pressure) with "Indiana Pack" burner at Mastic Asphalt Corp., South Bend, Ind. Furnished by Page Associates of Chicago. The Austin Co. were the Engineers and Contractors. ▶



FARRAR & TREFTS DIVISION
ADSCO INDUSTRIES, INC.
20 MILBURN ST. BUFFALO 12, N. Y.

WHO'S WHAT

Continued

gineer; Donald J. Jessup, order service and sales; Charles E. McAdoo, advertising manager.

▶ *GENERAL PLATE DIV., METALS & CONTROLS CORP.*—John Woodward, manager of marketing.

▶ *TUBE TURNS*—Clarence Matthews, assigned to sales development department.

▶ *SIEGLER CORP.*—William J. Keegan, president of Holly Mfg. Co., a division; J. Stanley Johnson, chairman of operations planning committee of Siegler's board of directors and of new product development division.

▶ *BRYANT MFG. CO.*—Gerald F. Deer, sales training manager.

▶ *A-P CONTROLS DIV., CONTROLS CO. OF AMERICA*—Herbert J. Keller, purchasing agent.

▶ *MODERN DIV., GEORGE GETZ CORP.*—A. Otto Miller, sales promotion manager.

▶ *CULLIGAN, INC.*—Ken Edwards, advertising manager.

IN THE TERRITORIES . . .

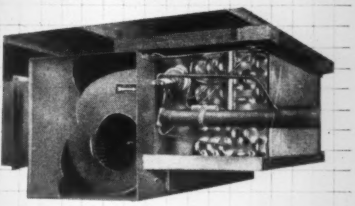
(Recent sales appointments)

▶ *FRIGIDAIRE DIV., GENERAL MOTORS CORP.*—William F. Cronin, manager of branch in Oakland; Edmund E. Bobock, manager of Atlanta branch; Ober L. Wortz, New Orleans branch manager; James R. Cobb, special sales representative for southeastern area of company's eastern sales division, replacing Mr. Wortz.

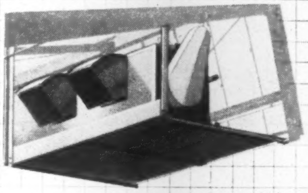
▶ *AIR REDUCTION SALES CO.*—Appointed regional vice presidents are: A. C. Brown, Jr., eastern region, with offices in New York City; D. D. Spoor, midwestern region, located in Chicago; J. J. Lincoln, Jr., southern region, with headquarters in Houston.

▶ *PERFECTION INDUSTRIES, DIV. OF HUPP CORP.*—Alan H. Jobson, Jr., district manager of New York area. Recently named wholesale distributors are: Electric Constructors, Inc., Alabama; W-F Distributing Co., Colorado, Panhandle section of Nebraska, southern Wyoming, western Kansas, northern New

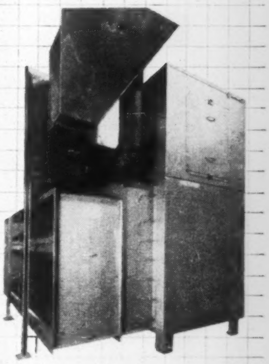
ONE-SOURCE
dependability!



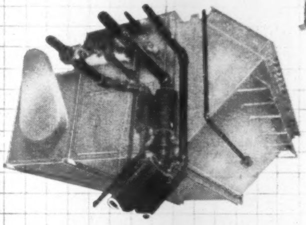
A TRACT HOME
d-h SPOTAIRE HRC
air conditioning from Crawl Space



A NEW DEFENSE PLANT
d-h AM *heating and ventilating equipment*



A 100-YEAR OLD CHURCH
d-h HHV-*Series air handling units*



A 450-ROOM HOTEL
d-h FZ *multizone air conditioners*

d-h system-type air conditioning
. . . 4 out of 7 complete lines in action—for any job.

Want the Full Story?

d-h SINCE 1910

drayer-hanson

3301 MEDFORD STREET • LOS ANGELES 63, CALIFORNIA
DIVISION OF NATIONAL-U.S. RADIATOR CORP.

WHO'S WHAT

Continued

Mexico; H. L. McMurry & Co., most of Florida; Twin-Falls Plumbing Supply Co., Idaho; Frost Distributing Co., 34 counties in southern Illinois; Rodgers & Baldwin Hardware, 34 Missouri counties, three Kansas counties, seven Oklahoma counties, 10 Arkansas counties; A. O. Jensen Wholesale Furnace & Supply Co., three-quarters of Nebraska, five Iowa counties neighboring Omaha; Toledo Merchandise Co., Toledo area.

▶ *MITCHELL MFG. CO.*—Harold Kreegel, district sales manager for air conditioners in Florida. Appointed district sales representatives are: John Riordan, New York City, northern New Jersey; Karl J. Berliant, northern Illinois, including Chicago, and Wisconsin; George Lucas, Texas-Oklahoma area; William J. Bagley, Missouri. Recently named distributorships include: Straus-Frank Co., Dallas and north Texas trading area; Raub Supply Co., Lancaster-Harrisburg, Pa., area.

▶ *ANSUL CHEMICAL CO.*—Vance Rutledge, representative in company's Kansas City area comprised of Missouri, Kansas, southern Illinois, western Iowa, Nebraska, Wyoming, Montana, Colorado.

▶ *JOSEPH T. RYERSON & SON, INC.*—Louis W. Werthman, sales manager for San Francisco Bay Area plant.

▶ *MANNING, MAXWELL & MOORE, INC.*—Roger Gilliland, sales engineer for West Coast for company's industrial controls division.

▶ *CLYDE TUBE FORGINGS OF AMERICA, INC.*—James L. Hollister, key accounts salesman for California.

▶ *METALBESTOS DIV., WILLIAM WALLACE CO.*—Jack Watson, representative for St. Louis district, including eastern Missouri, southern Illinois.

▶ *MARCO INDUSTRIES, INC.*—Joe E. Parker Co., to represent the company in Alabama, Florida, Georgia, Mississippi, the Carolinas, Tennessee, Virginia; Arthur A. Reed, application engineer for Michigan.

▶ *BALTIMORE AIRCOIL CO., INC.*—James F. Hayes, representative in Philadelphia area, including eastern Pennsylvania and southern and western New Jersey.

HEATING EQUIPMENT BY EMBASSY
• CONVECTORS
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• BOILERS
WRITE FOR FREE CATALOGS
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STEEL PRODUCTS INC.
EMBASSY STEEL PRODUCTS, INC.
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WHO'S WHAT

Continued

▶ *MITCHELL MFG. CO.*—Jae and Meyer, Inc., representative for seven state area in Northeast.

▶ *HYDROTHERM, INC.*—Gene Arledge Co., Inc., representative for Jackson, Miss., area; Edward J. Walsh, a similar appointment for Toronto, Canada.

▶ *McINTIRE CO.*—Jack Huff, to cover eastern Pennsylvania, Delaware, Maryland, Washington, D.C., southern New Jersey; George Miller, to cover Utah, Colorado, Wyoming, Kansas, New Mexico.

▶ *SUPERIOR VALVE & FITTINGS CO.*—William E. Kruse, assigned to sales staff of company's eastern district office.

▶ *O. A. SUTTON CORP., INC.*—Bill H. York, district sales manager in commercial division for Indianapolis, Cincinnati, South Bend, Louisville, Akron, Columbus, Ft. Wayne.

▶ *ELLIOTT CO.*—Howard A. Bach, sales manager of Lagonda Div. (tube cleaners and tube expanders), in Springfield, Ohio.

▶ *WATER SERVICE LABORATORIES, INC.*—Aaron Misrock, representative in Richmond area.

▶ *WARNER ELECTRIC BRAKE & CLUTCH CO.*—Ray Dollar, to cover Florida, south Georgia area.

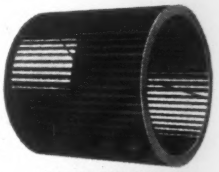
▶ *RUUD MFG. CO.*—Otto B. Barth, sales manager of special products division of H. R. Basford Co. The division of the Basford organization is responsible for marketing Ruud products in California.

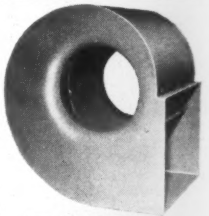
▶ *CLARK CONTROLLER CO.*—Edward M. Hanson, head of newly opened sales office in Baltimore, to serve Maryland and District of Columbia.

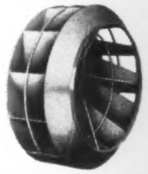
▶ *OTTO BERNZ CO.*—Stephen E. McPartlin, manager of newly established midwest regional sales district. The district embraces Illinois, Ohio, Kansas, Iowa, Michigan, Kentucky, Indiana, Missouri, Nebraska, Minnesota, Wisconsin, the Dakotas.

▶ *ALJON MFG. CO., INC.*—Associated Sales Engineers, representative for corrugated aluminum jacketing in Maryland, District of Columbia, Virginia, the Carolinas, Tennessee. ‡

Make
BARRY
BLOWER COMPANY
your dependable low cost source of supply for
POWER FAN EQUIPMENT


BFC, DI-DW Wheel

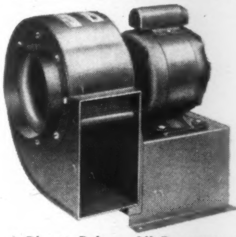

BFC, DI-DW Housing

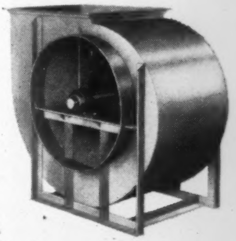

BBI Blower Wheel SI-SW. Class 2.

We offer users of power fan equipment a full line of blowers, multiple blower assemblies, direct and belt driven ventilating sets, cast iron blowers and various types of centrifugal blower wheels and housings. All sizes from 6" to 73".

ALL BARRY blower wheels and housings are precision made from steel, aluminum, brass, copper or stainless, and are expertly balanced and trued before shipment.

We make power fan equipment *exclusively,* and do not compete with our own customers . . . . . and, we have a high reputation for dependable quality and remarkably fast deliveries. Let us quote on our standard equipment, or upon your special sizes and specifications. Write us today.


↑ Direct Drive, All-Purpose Utility Blower


BBI Blower, SI-SW Arrangement No. 3, class 4 →

REPRESENTATIVES
A few territories available for sales representatives

BARRY BLOWER COMPANY
3100 California Street N.E. • Minneapolis 18, Minnesota

WE HEAR THAT . . .

▶ *DR. A. A. POTTER*, president of Bituminous Coal Research, Inc., and dean emeritus of engineering at Purdue University, has been awarded the Navy Distinguished Public Service Award. This honor, the highest that the Secretary of the Navy may confer on a civilian, was presented to Dr. Potter for his research on supercritical pressure and high temperature steam.

▶ At ceremonies highlighted by conversion of the sun's energy into electricity detonating dynamite to break ground, *TEXAS INSTRUMENTS, INC.* officially started construction of its new 280,000 sq ft, $4 million plant at Dallas for its Semiconductor-Components Div.

▶ *HENRY J. WALD*, consulting engineer, has announced the formation of a partnership with *ARTHUR L. ZIGAS*. The consulting engineering firm, known as *WALD & ZIGAS*, is located at 42-40 27th St., Long Island City, N.Y.

▶ "Molded Masters of the Btu" is the title of a new color sound slide film produced by The Magnesia Insulation Manufacturers Association. Describing a family of four thermal insulations for piping equipment ranging 200 to 1900 F, the film depicts insulating theory, ingredients, production, application and the properties of insulating materials required for various installations. Supervised showings are offered by the association to interested groups.

▶ The boards of directors of *UNITED STATES AIR CONDITIONING CORP.* and *HUGHES-KEENAN CORP.* have announced their agreement to merge. The move is subject to the approval of the stockholders of both companies.

▶ *YORK CORP.*'s top 25 distributors in the U.S. were awarded the company's "Medal of Merit" during a three-day convention held recently at Miami Beach. The award is given annually by York to approximately 25 distributors for outstanding performance in relation to assigned quotas and in comparison with their fellow distributors.

▶ Plans to build a 50 million lb per year unit to manufacture fluorocarbons have been announced by *CARBIDE AND CARBON CHEMICALS CO.*, a division of *UNION CARBIDE AND CARBON CORP.* The production unit is to be built at the Institute,

TRADE FRICK MARK®

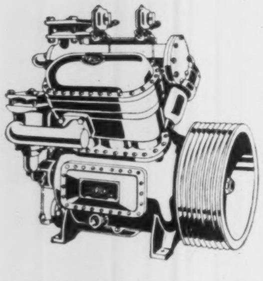
Air Conditioning
Serves Throughout
this Unique Hotel

CLAYPOOL HOTEL

Famed as the first COMPLETELY air-conditioned large hotel north of the Mason-Dixon Line, the Claypool at Indianapolis selected Frick equipment because it had used Frick Refrigeration for food service since 1939.

Nine Frick "ECLIPSE" compressors, installed by Decker and Roberts of Fort Worth, carry the air conditioning load, which is divided into three systems.

You get the utmost in air conditioning, ice making, quick freezing and other cooling services when you specify "Frick." Let us quote now on your commercial or industrial cooling needs.



Nine Frick "ECLIPSE" Compressors Air-Condition the Claypool Hotel at Indianapolis

FRICK COMPANY • WAYNESBORO, PENNA.

WE HEAR THAT

Continued

West Virginia plant of Carbide and Carbon and is expected to be in operation by the latter half of 1958.

▶ *REZNOR MFG. CO.* has purchased the assets of *ARTHUR A. OLSON & CO.* The purpose of the acquisition is to expand the Reznor line of gas unit heaters to include units of larger capacities, according to *DAVID R. WEBSTER*, Reznor president.

▶ *MINNEAPOLIS-HONEYWELL REGULATOR CO.* has moved its midwest regional sales office and distribution center to a new building in Lincolnwood, Ill., a suburb northwest of Chicago. The structure has about 21,000 sq ft of floor space and is located on almost 100,000 sq ft of land.

▶ Recent ground breaking ceremonies attended by civic and industrial leaders from the Los Angeles and San Francisco areas launched construction of a multimillion dollar air separation and liquefaction plant at Bassett, Calif., for *AIR REDUCTION PACIFIC CO.*, a division of *AIR REDUCTION CO., INC.* The plant will be designed to produce daily 55 tons of liquid oxygen, 15 tons of liquid nitrogen and 3½ tons of liquid argon. Completion is scheduled for late this year.

▶ *JAMES B. CLOW & SONS, INC.* has recently taken on a new line of air conditioning products to be manufactured and supplied by *DAY & NIGHT MFG. CO.* The new units will include a line of light commercial air conditioning equipment of both remote type air cooled and self contained air cooled designs.

▶ The polyester molding compounds field will be entered by *DUREZ PLASTICS DIV., HOOKER ELECTROCHEMICAL CO.* when a $570,000 project at North Tonawanda, N.Y., is completed and in operation on a commercial scale in the early fall.

▶ *CRANE PACKING CO.* has purchased and put into operation a 30,000 sq ft one-story plant at Vandalia, Ill. The structure is being used to augment the company's home plant manufacturing facilities. Initially it is being devoted to production of mechanical seals for pumps, compressors, speed reducers, and other rotating shaft equipment.

▶ A year-long sales incentive program for *CARRIER CORP.* dealers and distributors will be climaxed with an 11 day Caribbean cruise and a six day Mexico City

More Than 500

DeZurik Valves in

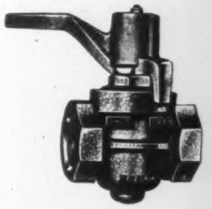
Southdale Center

This beautiful, modern shopping center in Edina, Minnesota, covers 800,000 square feet of floor space under one roof and utilizes a unique heating and air conditioning system.

During summer, cold water, between 48° and 50°F, is pumped up from the "Jordan sandstone stratum" four hundred feet under the surface. As this water cools the store, its temperature will rise to 70° - 90°. This water will then be pumped to a sand and gravel layer 75 to 100 feet underground. During the cold weather this water will be pumped back through the building, furnishing heat, and then returned to the original Jordan level for recirculation in the summer.

More than 500 DeZurik Valves (iron body, rubber-faced plug) are in use on this interesting system. There's good reason to make DeZurik YOUR choice, too! They don't leak . . . operate easily . . . require no lubricating . . . are available in a full range of materials . . . and with a complete line of operators for automatic operation.

Before you specify new or replacement valves, get the complete story on DeZurik Easy Operating Plug Valves. We'll be happy to send you details; just write



DeZURIK CORPORATION
SARTELL, MINNESOTA.

WE HEAR THAT

Continued

holiday in January and February of next year. About 600 distributors and dealers and their wives will make the Caribbean trip, Carrier reports.

▶ A new business management program is being offered to mechanical (heating, piping and air conditioning) contractors by the plumbing and heating division of *AMERICAN RADIATOR & STANDARD SANITARY CORP.* Included in the program is a new motion picture entitled "Your Witness," which points up many of the management problems encountered by contractors. Following the motion picture, aid will be extended by American-Standard in the form of "packaged" business management clinics, each one with plans, booklets and other materials.

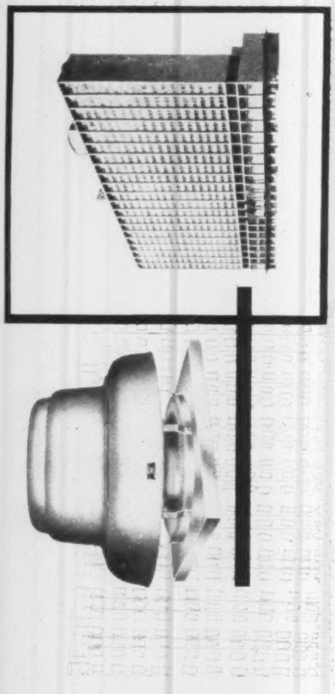
▶ *SCOVILL MFG. CO.* has purchased 93 acres of land in the northern part of New Milford, Conn. The company anticipates that construction of a 1150 × 200 ft tube mill with necessary service adjuncts on a railroad siding will start this spring.

▶ Two colored sound slide films designed to show maintenance people how to install and properly maintain electric motors are now available from *ALLIS-CHALMERS MFG. CO.* for showing. The films, titled "How to Make a Motor Go and Go and Go and Go," covering maintenance, and "How to Take Step Seven," dealing with proper installation, depict by means of cartoon characters and illustrations how motors can be kept in good operating condition.

▶ New office addresses for branch offices have been announced by *JOHNSON SERVICE CO.* The Salt Lake City branch has been moved to 1193 S. Third West St., the Phoenix office has been relocated to 2641 E. Adams St., the Macon, Ga., facility is now at 803 Second St., and the Grand Rapids, Mich., office address is now 1346 Burton St., S.E.

▶ A training school to teach proper handling of "Ramset" powder actuated fastening tools is being held by *RAMSET FASTENING SYSTEM, OLIN MATHIESON CHEMICAL CORP.* The school began its first three-day session on January 28. New classes start every other week at the company's headquarters in Cleveland.

▶ *WOLVERINE TUBE, DIV. OF CALUMET & HECLA, INC.* has opened new office and mill depot facilities in Pittsburgh and Atlanta. They stock the company's lines of copper water tube, refrigeration tube and automotive tube.



PENN VENTILATORS/play an important role in providing new SKYLINE BEAUTY . . .

PHILADELPHIA'S NEW SHERATON HOTEL

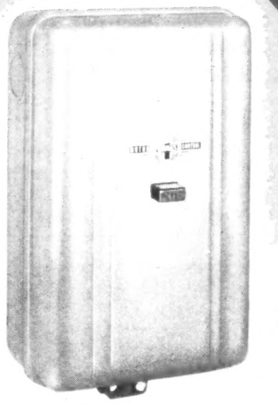
From skyscrapers to rambling one story plants, Penn Ventilators' silhouettes enhance building appearances. Modern housing designs and efficiently engineered fans reflect well on your specifications. Complete catalogue information is available at the addresses listed below or from the Penn Ventilator man in your area.

PENN VENTILATOR CO.
PHILADELPHIA 40, PA.
RIGHT ON TOP . . . FOR MORE THAN 30 YEARS

IN CANADA—TORONTO: CONTROL & METERING, LTD., 2271-A BLOOR ST., W. MONTREAL: AIR-CARE, LTD., 2222 BEACONSFIELD AVE. Member of the Air Moving & Conditioning Association

SAVE 2 WAYS WITH FURNAS

"In Between" STARTER SIZES



LOWER COST—save up to 25% by buying the exact size starter for the job, instead of having to take a standard one that may be too large.

LESS SPACE—save up to 40% by selecting a compact starter of a size designed to fit your requirement.

Furnas offers you 10 Magnetic Starter sizes instead of the usual five—5 standard and 5 "in-between" sizes. The "in-between" sizes allow you to choose the control that is exactly suited for your particular job when a standard size is not quite right. No need to waste money or space on a starter that is too large.

For information on our complete line of air conditioning and refrigeration controls, write for Bulletin 5519. Furnas Electric Company, 1041 McKee Street, Batavia, Ill.

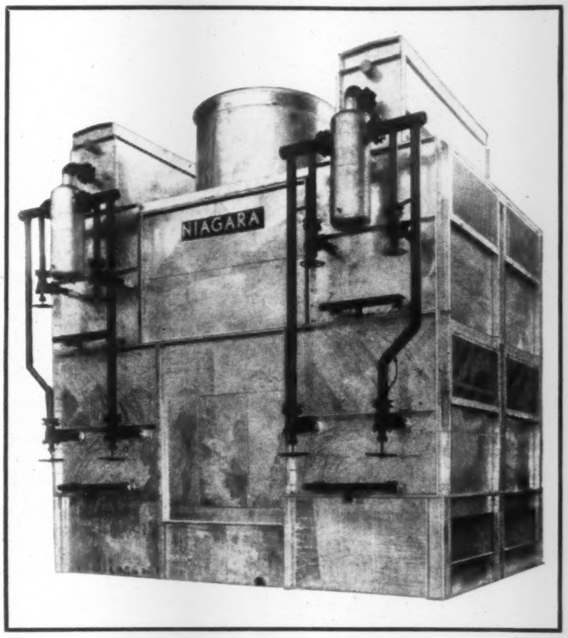
A31

FURNAS

25th YEAR

FURNAS ELECTRIC COMPANY
BATAVIA, ILLINOIS
SALES REPRESENTATIVES IN ALL PRINCIPAL CITIES

Large refrigeration plants save money with NIAGARA high efficiency condensers

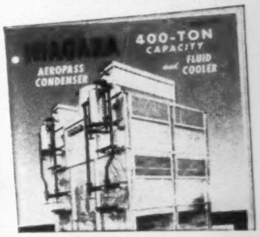


In size ranges from 100 to 450 tons refrigeration Niagara's "Super" Condensers save power, save large cooling water and water handling expenses and help the user avoid most of the upkeep problems and troubles of a refrigerating plant. Always full condensing capacity is assured by the "Duopass" pre-cooling coils which remove the superheat and bring about condensing at low temperatures. Complete accessibility assures labor saving, inexpensive upkeep.

NIAGARA BLOWER COMPANY
Dept. HP-4, 405 Lexington Avenue
NEW YORK 17, N. Y.
District Engineers in Principal Cities

Write for complete information.

Ask for Niagara Condenser Bulletins 123 and 131.



NIAGARA 400-TON CAPACITY FLUID and COOLER

AEROPASS CONDENSER

NIAGARA *Over 40 Years' Service in Industrial Air Engineering*

WE HEAR THAT

Continued

▶ Over 150 *CARRIER CORP.* dealers and distributors were guests of the firm recently as part of the prize awarded them following a three-month nationwide sales contest. Winners were chosen on the basis of their sales of "Weathermakers" for commercial, industrial and residential use.

▶ *PINES ENGINEERING CO., INC.* has produced a 40 min color sound film covering new machine bending techniques. The film shows both standard and special tooling applications in 36 different locations ranging from modest shop jobs to large multiplant organizations, says the company. It is available from Pines on free-loan to interested manufacturers.

▶ The Philadelphia district sales office and warehouse of *PENN CONTROLS, INC.* have been moved to a new location in that city "to better serve the control requirements of manufacturers, wholesalers and dealers in the metropolitan Philadelphia area." The new address is 620 Huntingdon Pike, Rockledge, Philadelphia 11.

▶ *GRABLER MFG. CO.* has opened a new warehouse in Detroit to serve the general Michigan area.

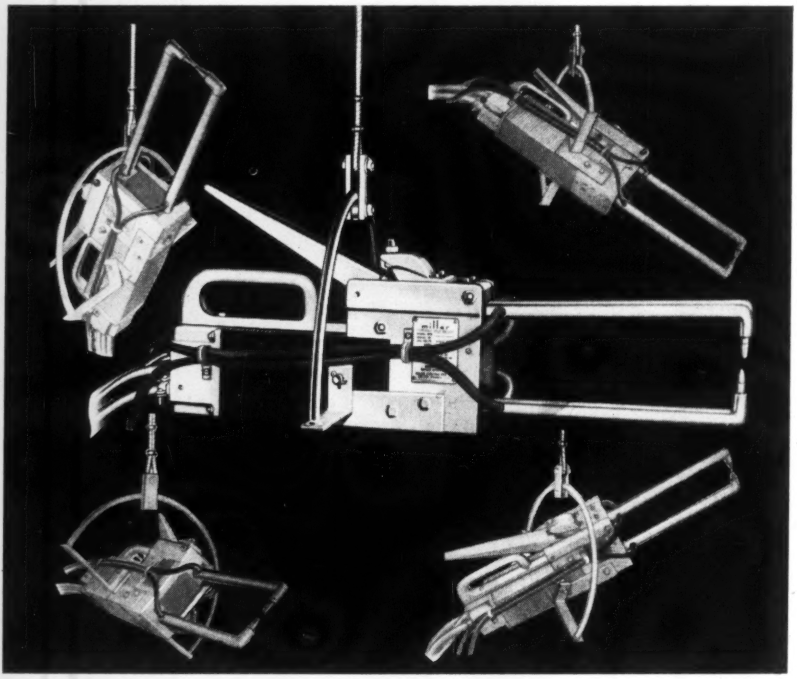
▶ *BALDOR ELECTRIC CO.* has built a new manufacturing plant at Ft. Smith, Ark. The one-story building occupies approximately 10,000 sq. ft. The facility will be used for the manufacture of 1/3 to 5 hp motors.

▶ *EUTECTIC WELDING ALLOYS CORP.* has opened a new warehouse-service center in Phoenix designed to provide prompt delivery of the company's products to Arizona's expanding industry. The facility will be supervised by *JOHN MAFFEO.*

▶ *CARRIER CORP.* was among 23 national winners to receive a "Plant America" award from the American Association of Nurserymen. The award was received "in recognition of achievement in industrial landscaping and beautification contributing to employee and civic pride."

▶ *BRISTOL CO.* has opened a new branch factory and warehouse in Houston. The move reflects the shifting market for automatic controlling, recording and telemetering instruments, the company says.

▶ The Cleveland district office of *NIAGARA MACHINE & TOOL WORKS* has moved to new quarters at 6333 York Rd.



WORKS ALL THE ANGLES

MPS Portable

Water Cooled

Spot Welder

Manually or air operated, these welders are equipped with ball bearing suspension rings for fatigue-free operation. Water cooled transformer and tongs. 6″ tongs grip work with pressure up to 600 pounds. Air models actuated by 4-way valve, electrically operated. Made for 50/60 cycle 220 volt use, Model 10-KVA weighs 79 lbs., welds material up to 3/16″; Model 20-KVA weighs 91 lbs., handles 1/4″ combined thickness. Air operated models average 53 lbs. more. Available also in pedestal style.

miller ELECTRIC MANUFACTURING COMPANY, Inc. • Appleton, Wisconsin

Distributed in Canada by: Canadian Liquid Air Co., Ltd., Montreal, P. Q.

☆ ☆ ☆

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Are you interested in securing additional lines?

We are occasionally asked by our manufacturer advertisers to suggest the names of manufacturers' agents in various sections of the country whom they can contact in regard to representation of their industrial and large building heating, piping, and air conditioning products.

If you would like your name listed on our records for inquiries we may receive on your territory, we invite you to write us. There is no charge in connection with this service.

Heating, Piping & Air Conditioning

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CHICAGO 2 ILLINOIS

☆ ☆ ☆

"WITCH"

PIPE HANGERS
FOR
HEATING – PLUMBING
POWER & PROCESS

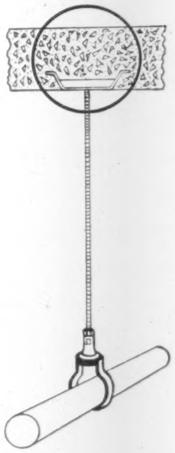
- LOW COST
- FULL LATERAL ADJUSTMENT
- DESIGNED FOR THICK OR THIN SLAB
- ONE BODY SIZE WITH REMOVABLE NUT
- EASILY REMOVED KNOCKOUT IN BOTTOM PREVENTS CONCRETE LEAKAGE

FIG. 75
CONCRETE
INSERT
(WITH KNOCKOUT)

Our catalogue illustrates a *complete* line of Pipe Hangers & Supports and is an indispensable reference book for engineers, contractors, estimators & erectors. Write for your copy now.

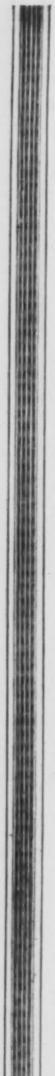
MAINTAINING OFFICES AND WAREHOUSES ACROSS THE NATION

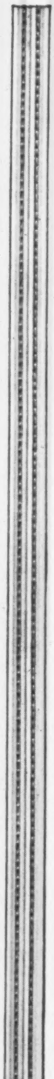
CARPENTER and PATERSON, Inc.
18 HURLEY ST., CAMBRIDGE, MASS.



"WITCH"
PIPE HANGERS AND SUPPORTS

Slot STRIPLINE DIFFUSERS by AGITAIR® Slot





STRIPLINE combines the best features of both slots and efficient air diffusers to provide equalized air flow throughout its entire length.

STRIPLINE slot diffusers are slenderly designed, inconspicuous, practical and versatile. These slot diffusers can be located in walls, ceilings, coves, moulds, window reveals and stools or almost anywhere to suit interior design.

Write for complete Stripline Catalog.

AIR DEVICES INC. • 185 MADISON AVENUE • NEW YORK 16, N. Y. • AIR DIFFUSERS • FILTERS • EXHAUSTERS

MEETINGS & CONVENTIONS

APRIL 8-12—*American Welding Society,* national spring meeting. Hotel Sheraton, Philadelphia. To be held in conjunction with the Fifth Welding and Allied Industry Exposition, Convention Hall, Philadelphia. Information: American Welding Society, 33 W. 39th St., New York 18.

APRIL 9-10—*Automatic Control for Process Industries.* University of Wisconsin, Madison. Information: Ralph D. Smith, institute coordinator, University of Wisconsin, Madison.

APRIL 10-12—*National Nuclear Instrumentation Conference* and *Third Southeastern Exhibit.* Atlanta. Information: Herbert Kindler, Instrument Society of America, 313 Sixth Ave., Pittsburgh 22.

APRIL 14-27—*United States World Trade Fair.* Coliseum, New York. Information: United States World Trade Fair, 331 Madison Ave., New York.

APRIL 15-17—*Building Research Institute,* sixth annual meeting. Drake Hotel, Chicago. BRI headquarters: 2101 Constitution Ave., Washington 25, D.C.

(*Oil-Heat Institute of America's* third annual commercial-industrial oil burning and equipment conference, previously announced on these pages as being scheduled for April 15-17 at New York University, has been indefinitely postponed, according to OHI.)

APRIL 18-19—*Bituminous Coal Research, Inc.,* annual meeting and techno-sales conference. The Greenbrier, White Sulphur Springs, W. Va. BCR headquarters: 121 Meyran Ave., Pittsburgh 13.

APRIL 22-23—*Tri-State Anthracite Conference.* Mark Twain Hotel, Elmira, N.Y. Anthracite Information Bureau, 342 Madison Ave., New York 17.

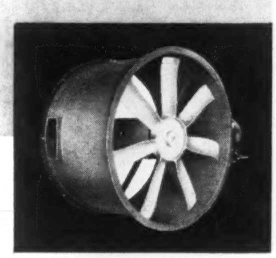
APRIL 20-26—*12th National Industrial Health Conference.* Kiel Auditorium, St. Louis. Information: Industrial Health Conference, 28 E. Jackson Blvd., Chicago 4.

MAY 1-2—*National Warm Air Heating and Air Conditioning Association,* second annual technical conference. Hotel Cleveland, Cleveland. NWAHACA headquarters: 640 Engineers Bldg., Cleveland 14.

MAY 3—*Fourth Annual Conference for Engineers and Architects.* Ohio State University. Sponsored by

"giving acid fumes the air..."
at NORTH AMERICAN
NAA

with new **Aerovent**



"SP-7" 7-blade semi-pressure DUCT FANS

Installed at the Columbus, Ohio plant of North American Aviation, Inc., new Aerovent "SP-7" Belt-Driven Duct Fans, with 7-blade "Macheta" Airfoil Propellers, remove acrid fumes and vapors from a spray-type processing machine. At temperatures of 180° to 200° F., the solution flashes into steam and noxious fumes which would contaminate the entire area if unabated. Located above each end of the spray section, and at intermediate points, the fans induce a steady flow of air through the unit to trap and remove heavy vapors at their source.

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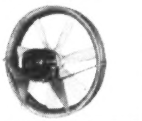

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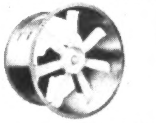

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Van-Cor

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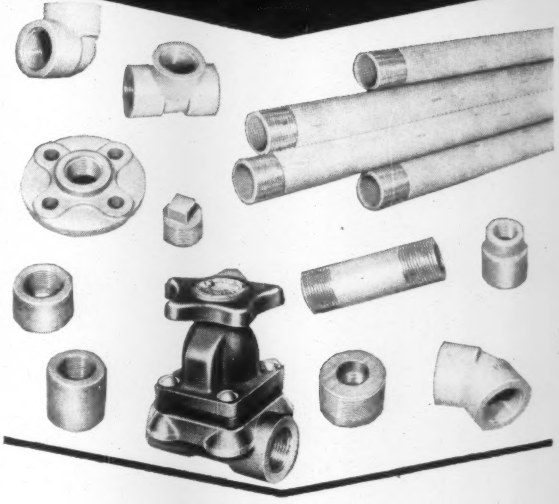

- ★ *Both Chemical Resistant, Normal Impact, and Chemical Resistant, High Impact*
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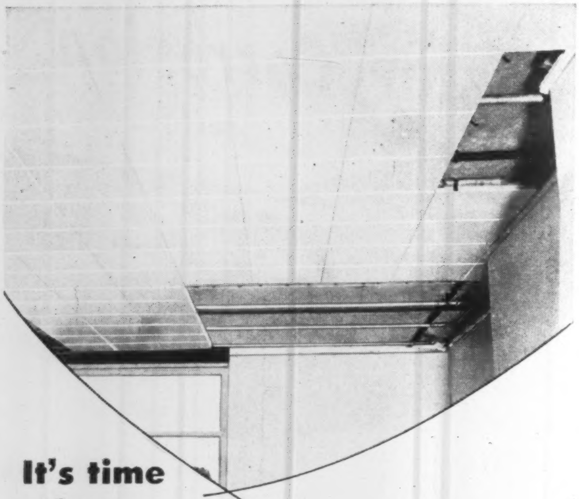

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△ Increase floor space
△ Smaller ducts and air handling equipment
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MEETINGS & CONVENTIONS

Continued

College of Engineering, Ohio State University, Columbus.

MAY 4-8—*Western Air Conditioning, Heating, Ventilating and Refrigeration Conference and Exhibit.* Shrine Exposition Hall, Los Angeles. Information: Fred J. Tabery, 3443 S. Hill St., Los Angeles.

MAY 6-8—*Air-Conditioning and Refrigeration Institute*, annual meeting. The Homestead, Hot Springs, Va. ARI headquarters: 1346 Connecticut Ave., N. W., Washington 6, D.C.

MAY 7-10—*Mechanical Contractors Association of America*, annual meeting. Hotel Fontainebleau, Miami Beach. The association is at 30 Rockefeller Plaza, New York 20.

MAY 8-11—*Fluid Control Institute, Inc.* The Greenbriar, White Sulphur Springs, W.Va. Information: Fluid Control Institute, Inc., P.O. Box 191, Decatur, Ill.

MAY 12-15—*National Industrial Service Association, Inc.*, 24th annual convention. Hotel Statler, Buffalo. NISA headquarters: 818 Olive St., St. Louis 1.

MAY 14-16—*Industrial Nuclear Technology Conference.* Museum of Science and Industry, Chicago. Information: Dr. Leonard Reiffel, Armour Research Foundation, Illinois Institute of Technology, 10 W. 35th St., Chicago 16.

MAY 20-22—*National Association of Corrosion Engineers*, northeast region corrosion control conference. Syracuse University, Syracuse, N.Y. NACE headquarters: 1061 M & M Bldg., Houston 2.

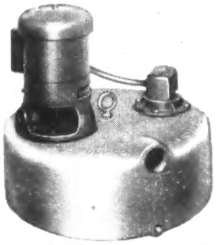
MAY 20-23—*Design Engineering Show.* Coliseum, New York. Management: Clapp & Poliak, Inc., 341 Madison Ave., New York 17.

MAY 20-24—*National Fire Protection Association*, 61st annual meeting. Hotel Statler, Los Angeles. NFPA headquarters: 60 Batterymarch St., Boston.

JUNE 2-5—*American Society of Refrigerating Engineers*, annual meeting. Hotel Fontainebleau, Miami Beach. ASRE headquarters: 234 Fifth Ave., New York.

JUNE 2-6—*Air Pollution Control Association*, golden jubilee meeting. St. Louis. Information: Harry

Low Return *Condensate Pumps*



SINGLE UNIT—Fig. 302A
10 Gal. Receiver for Single Units
Diameter 21″
Hgt. of Return above floor 6⅞″

Capacities 500 to 15,000 sq. ft. E.D.R.

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LOW SPEED, LONG LIFE
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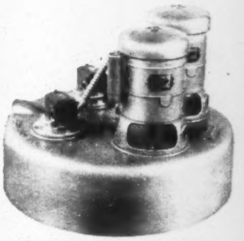

DUPLEX UNIT—Fig. 303B
15 Gal. Receiver for Single or Duplex Units
Diameter 25½″
Hgt. of Return above floor 7³⁄₁₆″

Unit Number	Max. Sq. Ft. Direct Radiation	Disch. Press. In Lbs. At Pump	GPM Radiation Will Condense	Capacity of Pump in GPM	Motor H.P.	Return Inlet in Inches	Pump Discharge in Inches	Diameter and Capacity of Receiver	Height of Return to Centerline
TVC-19	750	20	.38	1.5	¼	2	1	21″ -10 Gal.	6⅞″
TVC-23	1000	20	.5	1.5	¼	2	1	21″ -10 Gal.	6⅞″
TVC-29	2000	20	1.0	3.0	¼	2	1	21″ -10 Gal.	6⅞″
TVC-35	4000	20	2.0	6.0	¼	2	1	21″ -10 Gal.	6⅞″
TVC-41	6000	20	3.0	9.0	⅓	2	1	21″ -10 Gal.	6⅞″
TVC-47	8000	20	4.0	12.0	½	2	1	25½″-15 Gal.	7³⁄₁₆″
TVC-52	10000	20	5.0	15.0	¾	2	1	25½″-15 Gal.	7³⁄₁₆″
TVC-54	15000	10	7.5	22.5	½	3	1¼	25½″-26 Gal.	10½″
TVC-55	15000	20	7.5	22.5	¾	3	1¼	25½″-26 Gal.	10½″
TVC-56	15000	30	7.5	22.5	1	3	1¼	25½″-26 Gal.	10½″
TVC-57	15000	40	7.5	22.5	1½	3	1¼	25½″-26 Gal.	10½″

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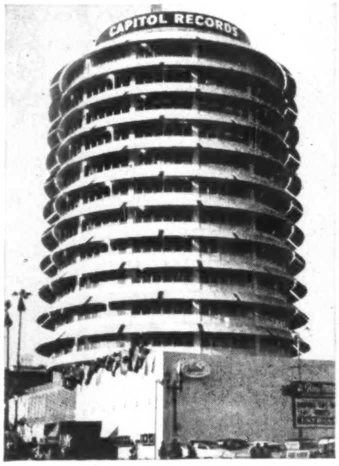

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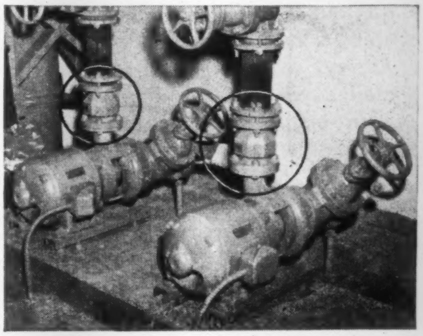

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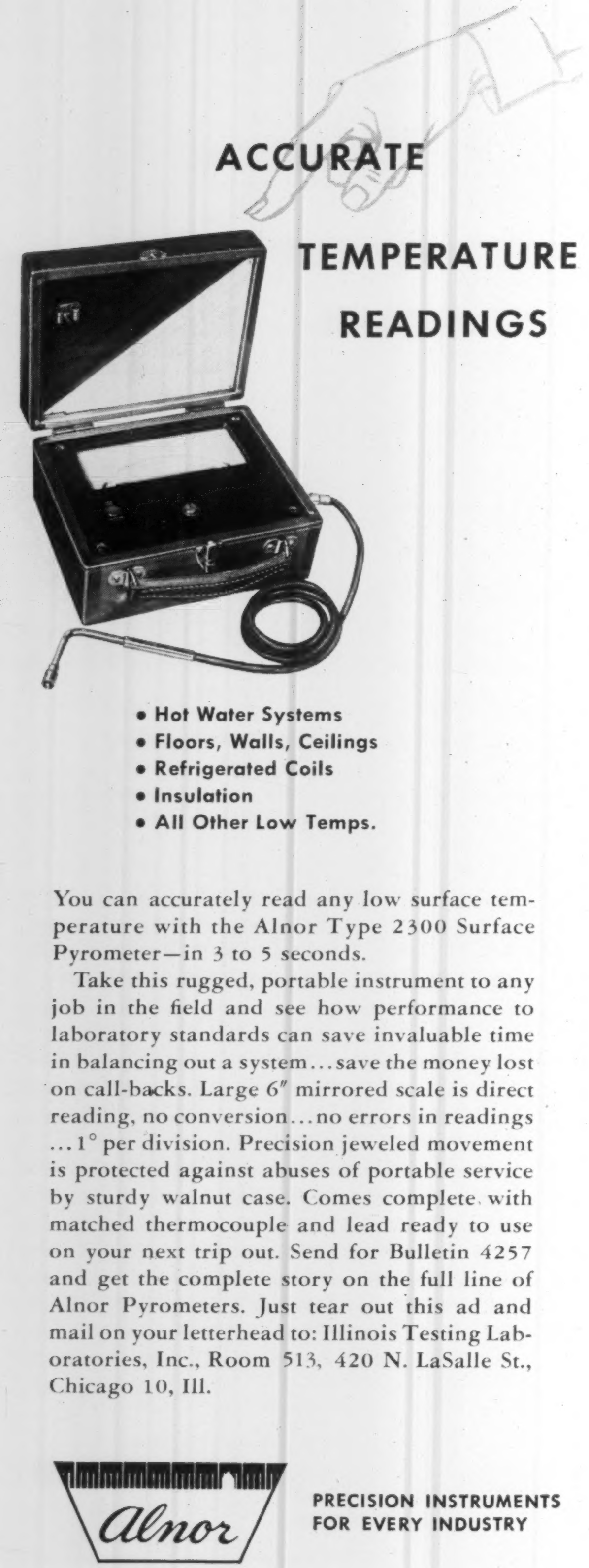

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MEETINGS & CONVENTIONS

Continued

C. Ballman, executive secretary, APCA, 4400 Fifth Ave., Pittsburgh 13.

JUNE 3-6—*National District Heating Association*, 44th annual meeting. The Homestead, Hot Springs, Va. Information: John F. Collins, Jr., secretary-treasurer, NDHA, 827 N. Euclid Ave., Pittsburgh.

JUNE 3-7—*Oil-Heat Institute of America, Inc.*, 35th annual convention. Sheraton-Plaza Hotel, Boston. OHI headquarters: 500 Fifth Ave., New York 36.

JUNE 5-7—*National Warm Air Heating and Air Conditioning Association*, West Coast summer convention. Fairmont Hotel, San Francisco. NWAHACA headquarters: 640 Engineers Bldg., Cleveland 14.

JUNE 11-13—*Third Western Plant Maintenance and Engineering Show*. Civic Auditorium, San Francisco. Management: Clapp & Poliak, Inc., 341 Madison Ave., New York 17.

JUNE 16-21—*American Society for Testing Materials*. Chalfonte-Haddon Hall, Atlantic City. ASTM headquarters: 1916 Race St., Philadelphia 3.

JUNE 24-27—*American Society of Heating and Air-Conditioning Engineers, Inc.*, semi-annual meeting. Manoir Richelieu, Murray Bay, Quebec. Information: A. V. Hutchinson, executive secretary, ASHAE, 62 Worth St., New York 13.

AUG. 11-15—*First National Conference on Applied Heat Transfer*. Pennsylvania State University, University Park, Pa. Sponsored by heat transfer division and central Pennsylvania section of American Society of Mechanical Engineers in cooperation with College of Engineering and Architecture of the University. ASME headquarters: 29 W. 39th St., New York 18.

SEPT. 9-13—*12th Annual Instrument Automation Conference and Exhibit*. Cleveland Auditorium, Cleveland. Sponsored by Instrument Society of America, 313 Sixth Ave., Pittsburgh 22. Exhibit information: Fred J. Tabery, 3443 S. Hill St., Los Angeles.

SEPT. 18-20—*Insulation Distributor-Contractors National Association, Inc.*, second annual convention. St. Francis Hotel, San Francisco. Information: IDCNA, 1632 K St., N.W., Washington, D.C.

OCT. 1-4—*National Association of Corrosion Engi-*

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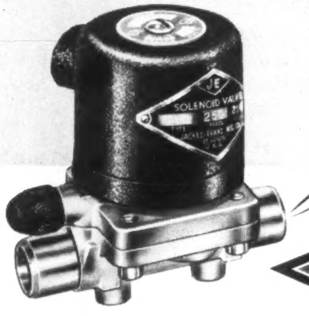

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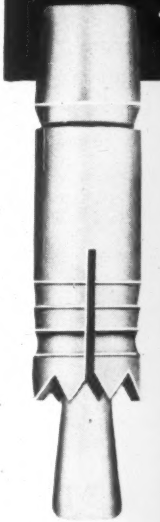

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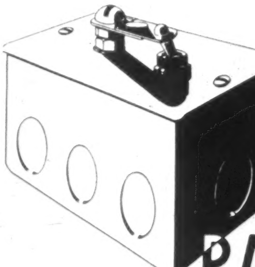

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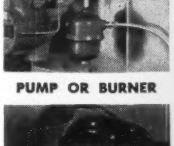

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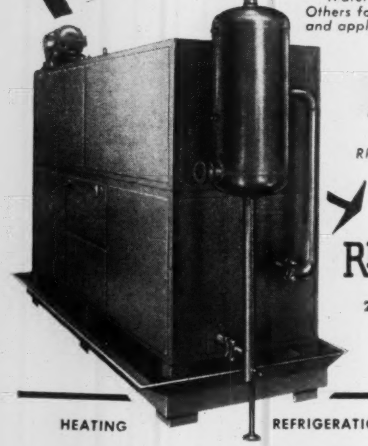

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MEETINGS & CONVENTIONS

Continued

neers, north central regional meeting. Chicago. NACE headquarters: 1061 M & M Bldg., Houston 2.

OCT. 1-4—*National Association of Corrosion Engineers*, south central regional meeting. Oklahoma City. NACE headquarters, 1061 M & M Bldg., Houston 2.

OCT. 6-8—*Fluid Control Institute.* Westchester Country Club, Rye, N.Y. Information: Fluid Control Institute, Inc., P.O. Box 191, Decatur, Ill.

OCT. 7-9—*American Gas Association*, annual convention. Kiel Auditorium, St. Louis. AGA headquarters: 420 Lexington Ave., New York 17.

OCT. 21-25—*45th National Safety Congress & Exposition.* Chicago. National Safety Council, 425 N. Michigan Ave., Chicago 11.

NOV. 12-14—*National Association of Corrosion Engineers*, north east regional meeting. Pittsburgh. NACE headquarters: 1061 M & M Bldg., Houston 2.

NOV. 13-14—*Air Pollution Conference.* Chicago. Cosponsored by Armour Research Foundation and Midwestern Air Pollution Prevention Association. Information: Conference secretary, Armour Research Foundation, 10 W. 35th St., Chicago 16.

NOV. 14-16—*American Society of Refrigerating Engineers*, semi-annual meeting. Morrison Hotel, Chicago. ASRE headquarters: 234 Fifth Ave., New York.

NOV. 16-18—*Air-Conditioning and Refrigeration Wholesalers*, annual meeting. Sheraton Hotel, Chicago. Information: 2607 N. High St., Columbus, Ohio.

NOV. 18-21—*10th Exposition of the Air-Conditioning and Refrigeration Industry.* International Amphitheater, Chicago. Air-Conditioning and Refrigeration Institute, 1346 Connecticut Ave., N. W., Washington 6, D.C.

NOV. 18-22—*National Warm Air Heating and Air Conditioning Association*, committee meetings and annual convention. Morrison Hotel, Chicago. NWAHACA headquarters: 640 Engineers Bldg., Cleveland 14.

JAN. 27-29, 1958—*American Society of Heating and Air-Conditioning Engineers, Inc.*, 64th annual meeting. Pittsburgh. Information: A. V. Hutchinson, executive secretary, ASHAE, 62 Worth St., New York 13. ‡

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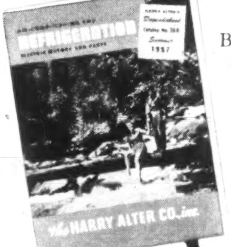

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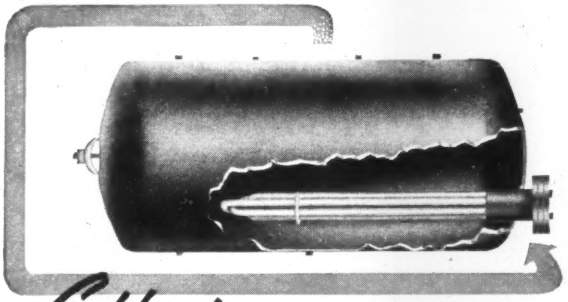

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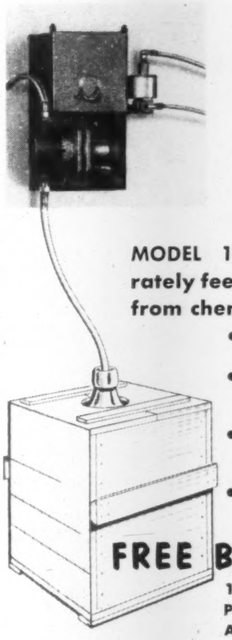

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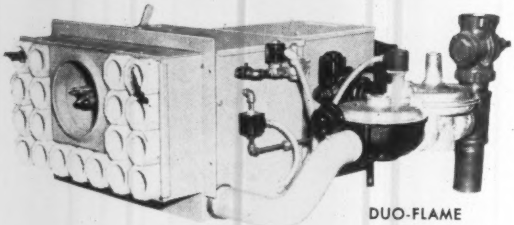

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Atmospheric Pollution, Its Origins and Prevention—By A. R. Meetham, D.Sc. Second Ed. 302 pp. Pergamon Press, Inc., 122 E. 55th St., New York 22. $9.50.

Supplement to 1955 Edition of ASTM Standard in Building Codes—224 pp. American Society for Testing Materials, 1916 Race St., Philadelphia 3. $2.75.

Relaxation Properties of Steels and Super-Strength Alloys at Elevated Temperatures—ASTM special technical publication No. 187. 104 pp. American Society for Testing Materials, 1916 Race St., Philadelphia 3. $4.00

Air Pollution Manual—American Foundrymen's Society, Golf and Wolf Rds., Des Plaines, Ill. $6.50. ($4.25 to members of AFS and of Air Pollution Control Association.) +

Obituaries

Ira Emmett McCabe

Ira Emmett McCabe, 62, a pioneer figure in the heating industry, died February 13. He was chief engineer and chairman of the board of Mercoid Corp., being associated with the company for the past 36 years. Over 100 patents had been issued to him, many of which were directly responsible for the advancement of the heating industry.

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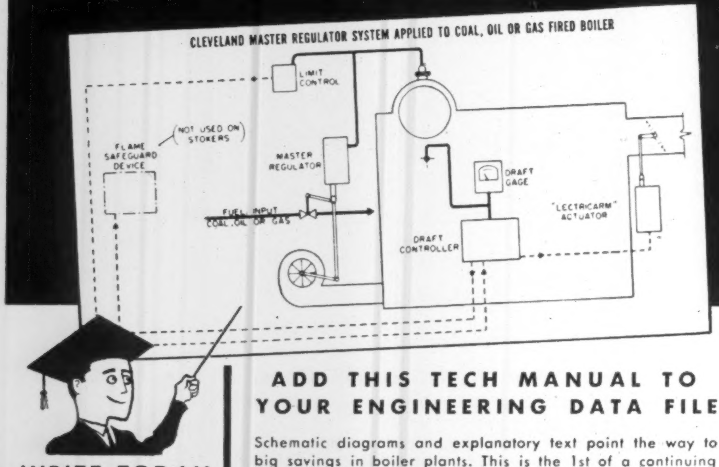

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INDEX TO ADVERTISERS

Firms represented in this issue are identified by the page on which their advertising appears. Advertising in other issues is marked with an asterisk.

A-J Mfg. Co. *
Acme Industries, Inc. 44, 45
Aerofin Corp. 241
Aerovent Fan Co., Inc. 295
Air Control Products, Inc. *
Air Devices, Inc. 294
Air Distribution Products 219
Air-Factors, Inc. 233
Air Filter Institute *
Air-Maze Corp. 239
Air Moving & Conditioning Association *
Airtemp Div., Chrysler Corp. *
Airtherm Mfg. Co. 263
Aladdin Heating Corp. *
Alco Valve Co. 231
Allen-Bradley Co. *
Allen Cooler & Ventilator Inc. *
Allen Mfg. Co., W. D. 302
Allis-Chalmers Mfg. Co. 32
Allis Co., Louis *
Alter Co., The Harry 301
American Air Filter Co., Inc. 42, 43, 54, 55, 280
American Blower Corp. 18, 19, 206
American Boa, Inc. 273
American Brass Co., The 56
American Dist. Steam Div., Yuba Mfg. Co. *
American Gilsonite Co. *
American Hard Rubber Co. 234
American-Marsh Pumps, Inc. *
American Metal Hose Branch American Brass Co. The *
American Radiator & Standard Sanitary Corp., Plumbing & Heating Div. *
American Society of Heating and Air-Conditioning Engineers Inc. 307
Ames Iron Works *
Ammerman Co., Inc. *
Anderson Co., V. D., Div. of International Basic Economy Corp. 301
Anemostat Corp. of America 29
Arcos Corporation *
Armstrong Cork Co. 25
Armstrong Machine Works 6
Aurora Pump Co. *
Automatic Devices Co., Inc. *

Babbitt Steam Specialty Co. 278
Babcock & Wilcox Co., Boiler Div. *
Babcock & Wilcox Co., Tubular Prod. Div. 217
Babcock & Wilcox Co., Tubular Product Div. Fittings Dept. *
Badger Manufacturing Co. 74
Baldwin-Hill Co. *
Barber-Colman Co. 41
Barnebey-Cheney Co. 64
Barry Blower Co. 287
Bell & Gossett Co. 210, 211
Bendix Westinghouse, Evansville Division *
Bethlehem Steel Company 63
B-I-F Industries, Inc. 301
Binks Mfg. Co. 232
Bishop & Babcock Mfg. Co. 229
Bituminous Coal Institute 249
Bohn Aluminum & Brass Corp. 31
Boiler Engineering & Supply Co., Inc. *
Bonney Forge & Tool Works *
Brundage Co., The *
Bruner Corp., The *
Brunner Mfg. Co. 227
Buensod-Stacey, Inc. *
Buffalo Forge Co. 73
Buffalo Pumps, Inc., Div. of Buffalo Forge Co. 68
Burgess-Manning Co. 296
Burnham Corporation 30
Byers Co., A. M. 4

Cambridge Filter Corp. *
Campbell Heating Co. *
Capitol Mfg. & Supply Co. 224
Carey Elec. Engr. Co. *
Carnes Corporation *
Carrier Corp. 37, 38, 39, 40
Carpenter & Paterson, Inc. 293
Carver Pump Co. 279
Cash Co., A. W. 57
Century Electric Co. 26
Cepi-American Inc. *
Champion Blower & Forge Co. *
Chase Brass & Copper Co. *
Chespeake and Ohio Railway 220
Chicago Blower Corp. 224
Chicago Pump Co. 187
Clarage Fan Co. Inside Back Cover
Cleaver-Brooks Co., Boiler Div. *
Cleaver-Brooks Co., Burner Div. *
Cleveland Fuel Eqpt. Co. 304
Combustion Control Div., Electronics Corp. of America *
Combustion Eng., Inc. *
Committee on Steel Pipe Research American Iron & Steel Institute *
Connor Engineering Corp. 69
Continental Air Filters, Inc. *
Cook Co., Loren *
Copeland Refrigeration Corp. *
Crane Co. 46, 47
Crescent Insulated Wire & Cable Co. 225

Continued on page 306

Dwyer CONTROLS GAGES

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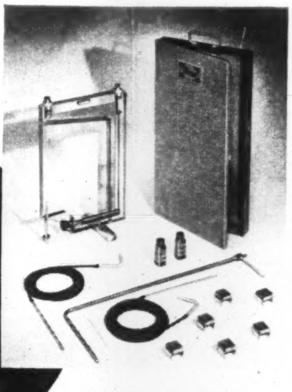

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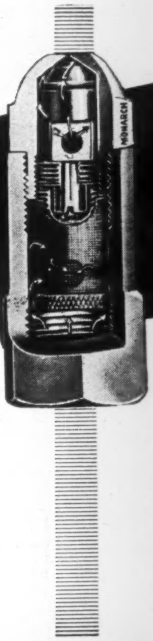

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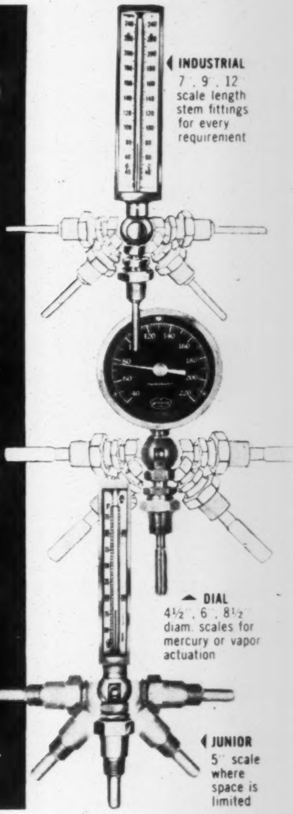

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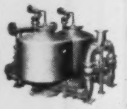

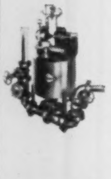

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INDEX TO ADVERTISERS

continued from page 304

Curtis Refri., Machine Div. of Curtis Mfg. Co. °
Cyclotherm Div., National-U.S. Radiator Corp. °

Davis Eng. Corp.
Davis Regulator Co.
De Bothezat Fans Division, American Machine & Metals, Inc. 3
DeLaval Steam Tubine Co. 253
Detroit Controls Corp. 270
Detroit Stoker Co.
DeZurik Corporation 239
Diamond Mfg. Co. 303
Dodge Mfg. Co.
Doerr Electric Corp. °
Dollinger Corp. 66
Dover Mfg. Co.
Dravo Corp. 14, 15
Drayer-Hanson, Div. of Natl.-U. S. Radiator Corp. 235
Dunham-Bush, Inc. 185
Durant Insulated Pipe °
Dwyer Mfg. Co., F. W. 305

Eagan Co., Inc., Walter H. °
Economy Pumps, Inc., Div. of C. H. Wheeler Mfg. Co. 277
Electro-Air Cleaner Co. °
Electro-Dynamic Div. of General Dynamics Corp. °
Elgen Mfg. Corp. °
Elliott Co. °
Embassy Steel Products 286
Evans Corp., The George °
Everlasting Valve Co. °

Fairbanks Co., The 260
Farrar & Trefts Div., Yuba Mfg. Co. 284
Farr Co. 7
Fedders-Quigan Corp. °
Fee & Mason Mfg. Co., Inc.
Field Control Div., H. D. Conkey & Co. °
Finn & Co., Inc., T. R. 276
Finnigan Co., J. J. 301
Fisher Governor Co. 81
Fitzgibbons Boiler Co., The 236
Flanders Mill, Inc. °
Flexaust Company °
Flexible Tubing Corp. 242
Flexonics Corp. 59
Fluor Products Co. °
Frick Co. 283
Friez Instrument Div., Bendix Aviation Corp. 240
Fulton Sylphon Div., Robertshaw-Fulton Cont. Co. °
Furnas Electric Co. 291

G. & O. Mfg. Co., The °
Gallaher Co., The 243
Garlock Packing Co. °
Gates Engineering Co. 304
General Blower Co. °
General Chemical Division, Allied Chemical & Dye Corp. 58
General Controls Co. 12, 13
General Electric Co. 203
General Fittings Co. °
Goodall Rubber Co. °
Goodrich, B. F., Chemical Co. 80
Goodrich, B. F., Sponge Products Div. 259
Goodyear Tire & Rubber Co., Inc. °
Gordon & Piatt, Inc. 302
Goulds Pumps, Inc. °
Governair Corp. °
Green Fuel Economizer Co., Inc. 265
Greenlee Tool Co. °
Grinnell Co., Inc. Inside Front Cover
Gustin-Bacon Mfg. Co. 238, 239

Handy & Harman 246
Hart & Cooley Mfg. Co. 188
Hayes Furnace Mfg. & Supply Co. °
Havens Structural Steel Co. 67
Heat-Timer Corp. °
Heat-X, Inc. 274
Hendrick Mfg. Co. °
Henry Valve Co. 189
Hoffman Specialty Mfg. Corp. °
Homestead Valve Mfg. Co. °
Howell Electric Motors Co. 237
Hussey & Co., C. G. 65

Ilg Electric Ventilating Co. °
Illinois Engineering Co., Div. of American Air Filter Co. 42, 43, 54, 55, 280
Illinois Testing Laboratories 298
Independent Register Co., The °
Industrial Acoustics Co., Inc. 228
Infra Insulation, Inc. 82
Ingersoll-Rand Co. 254
International Boiler Works Co., The 272
Iron Fireman Mfg. Co., SelecTemp Division 71

Jackes Evans Mfg. Co. 299
Jackson & Church Co. °
Janitrol Heating & Air Conditioning Div., Surface Combination Corp. °
Jenkins Bros., Inc. 212
Jenn-Air Co., Inc. °
Jewel Mfg. Co., Inc. °
Johns-Manville 72
Johnson Service Co. 50, 51
Jones & Laughlin Steel Corp. °

Continued on page 308

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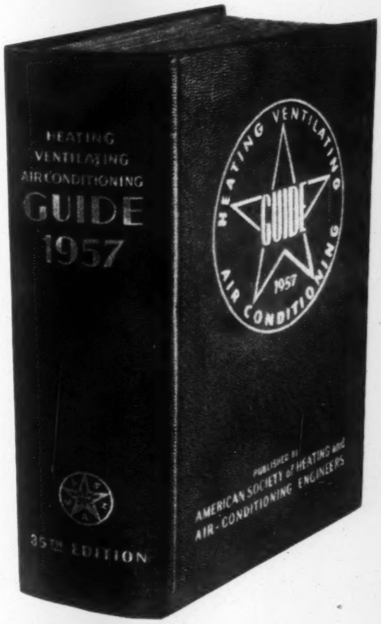
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INDEX TO ADVERTISERS

continued from page 306

Josam Mfg. Co. *
Joy Mfg. Co. *

Kaiser Aluminum & Chemical Corp. 183
Keasbey & Mattison Co. 52
Kennard Corp. *
Kennedy Valve Mfg. Co. *
Kewanee Boiler Division of American Standard *
Kewaunee Mfg. Co. *
Kinetic Chemicals Div., du Pont De Nemours & Co., Inc., E. I. 245
Koch Engineering Co. 226
Koppers Co., Inc., Fan Dept. *
Koppers Co., Inc., Industrial Sound Control Dept. 197
Korfund Co., Inc., The 308
Kramer Trenton Co. *
Kritzer Radiant Coils, Inc. *

Ladish Co. *
LaFavorite Rubber Mfg. Co. 248
Lau Blower Co. 62
Lawler Automatic Controls, Inc. 269
Leslie Company *
Lewin-Mathes Company 53
L. O. F Glass Fibers Co. 195
Lima Electric Motor Co. 221
Lima Register Co. *
Lunkenheimer Co., The *

Maid-O'-Mist, Inc. 247
Mammoth Furnace Company *
Manning & Lewis Engineering Co. 278
Marathon Electric Mfg. Corp. *
Marley Co., The 28
Marlo Coil Co. *
Marsh Heating Equipment Co. *
McDonald Mfg. Co., A. Y. *
McDonnell & Miller, Inc. Outside Back Cover
McQuay, Inc. *
Mercoid Corp., The 279
Mettler Div., Eclipse Fuel Engrg. Co. *
Mid-Continent Metal Prod. Co. *
Midwest Piping Company, Inc. *
Miller Electric Mfg. Co., Inc. 292
Miller Valve Co., Inc. 297
Minneapolis-Honeywell Regulator Co. 20, 21, 22, 23
Minnesota Mining & Mfg. Co. 261
Modine Mfg. Co. 190
Monarch Mfg. Works, Inc. 305
Morrison Products, Inc. *
Mt. Hawley Mfg. Co. *
Mueller Climatrol Div. of Worthington Corp. 257
Multi-Vent Div., Pyle-National Co., The 202
Murray Mfg. Co., D. J. *
Myers & Bro., F. E. *

Nash Eng. Co., The 94
National Heater Co., The *
National Tube Div., United States Steel Corp. 196
National-U. S. Radiator Corp. *
Nebraska Boiler Co. 33
Nelson, Herman Div. of American Air Filter Co., Inc. 42, 43, 54, 55, 280
Nesbitt, Inc., J. J. 86
New York Blower Co. *
Niagara Blower Co., The 291
Norman Products Co. *
Norwood Products Co. 299
Novelty Steam Boiler Works, Inc. *

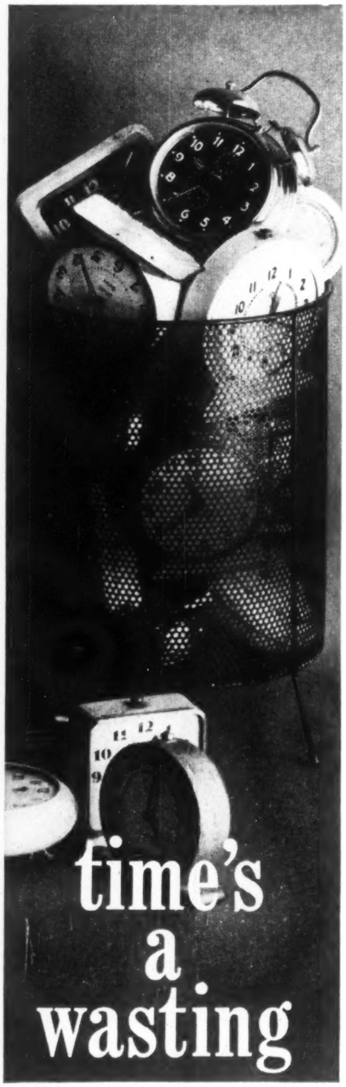
Ohio Brass Co. *
Ohio Injector Co., The *

Packless Metal Hose, Inc. 262
Palmer Thermometers, Inc. *
Parish Co., The 299
Patterson-Kelley Co., Inc., The 93
Peabody Engineering Corp. 244
Peerless Electric Co., The 182
Peerless of America, Inc. *
Penn Ventilator Co. 290
Petrometer Corp. *
Petro *
Phillips Cooling Tower Co., Inc. *
Pittsburgh Plate Glass Co., The Fiber Glass Division 180
Polis Mfg. Co., J. D. 299
Porter & Co., H. W. *
Powell Valves *
Power Line Fan Co. *
Powers Regulator Co. 177
Prat-Daniel Corp. *
Pritchard Co. of Calif., J. F. 205
Propellair Div., Robbins & Myers, Inc. *
Proportioneers, Inc., Div. of B-I-F Industries, Inc. 301

Quickdraft Company 282

R-P & C Valve Division, American Chain & Cable Co., The *
Ramset Fastening System Winchester-Western Div., Olin Mathieson Chemical Corp. *
Randall Graphite Bearing, Inc. 266
Ray Oil Burner Co. 181
Raypak Co., Inc. *
Reading Tube Corp. *
Recold Corp. *
Reed Mfg. Co. *
Refrigerating Specialties Co. *
Reliance Electric & Eng. Co. 60, 61

Continued on page 310



The clocks keep ticking away. We need your dollars to make each minute count in the fight against cancer.

With $70, we can buy an eyepiece micrometer . . . $48 buys a laboratory flowmeter...$15 buys an instrument sterilizer . . . $3.75, a hematocrit reader.

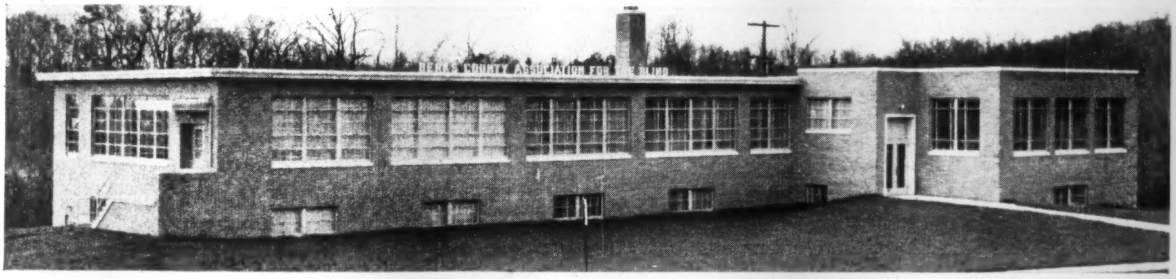
Only you can decide how much you can afford to send. But send it *today*, to help us keep moving ahead in the struggle to save lives.

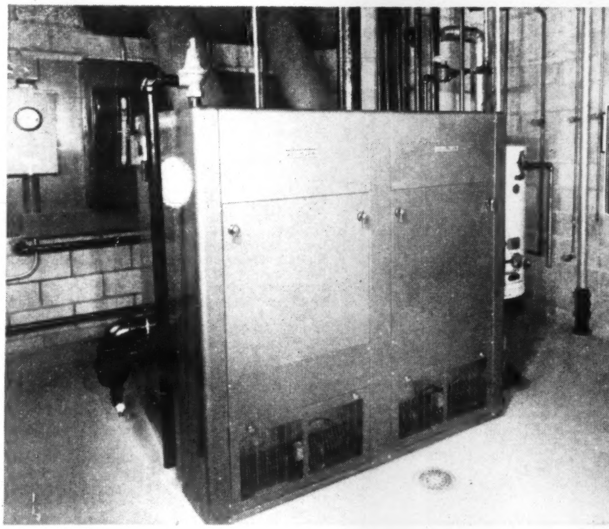
Send a generous check to "Cancer" c/o your local Post Office.

AMERICAN CANCER SOCIETY

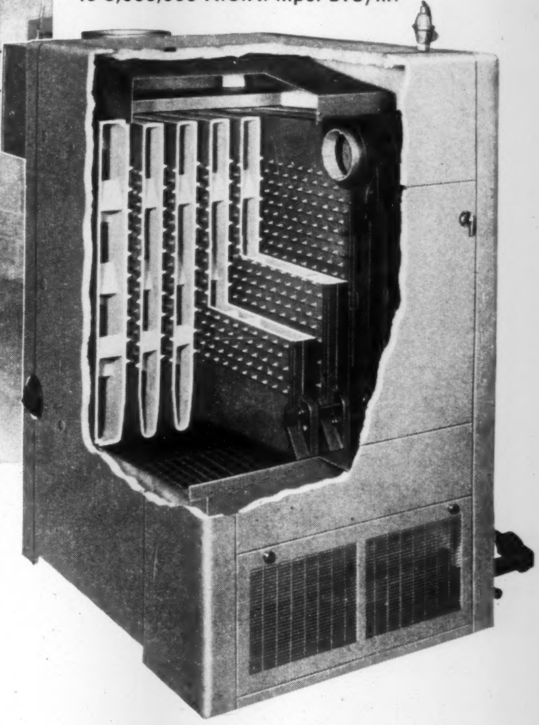
CUT LABOR COSTS...WITH

WEIL-McLAIN TYPE J CAST IRON GAS-FIRED BOILERS





The Reading Association for the Blind, Reading, Pa., relies on a Weil-McLain Type J Gas Boiler for dependable, economical heating



Available in single and multiple units in capacities from 625,000 to 5,000,000 A.G.A. input BTU/hr.

In this school installation, the Weil-McLain Type J Gas Boiler fully lives up to its reputation as an "extra value" unit.

In the matter of labor, for example, the installing contractor, Walter H. Fritz & Company, West Reading, Pennsylvania, writes—

"Although this was the first J Series Boiler we have ever installed, we found that the erection of it went along very smoothly. Two men did the complete job of installing this boiler. We also found that the jacket supplied with this type boiler fit well without any cutting or alterations of any kind. A final test was made after the complete job was installed and we found the boiler was very efficient."

The Type J Boiler is cast iron—for long life and minimum repairs and maintenance. It is compact in design, requiring less floor space and head room. Assembly with short draw-rods simplifies installation—assures a strain-free assembly. Critical examination of its design reveals construction which develops high efficiency in burning fuel and absorbing heat.

This boiler burns all gases, including LP and LP-air and is equipped with controls for completely automatic, safe operation.

WEIL-McLAIN
BOILERS · RADIATORS

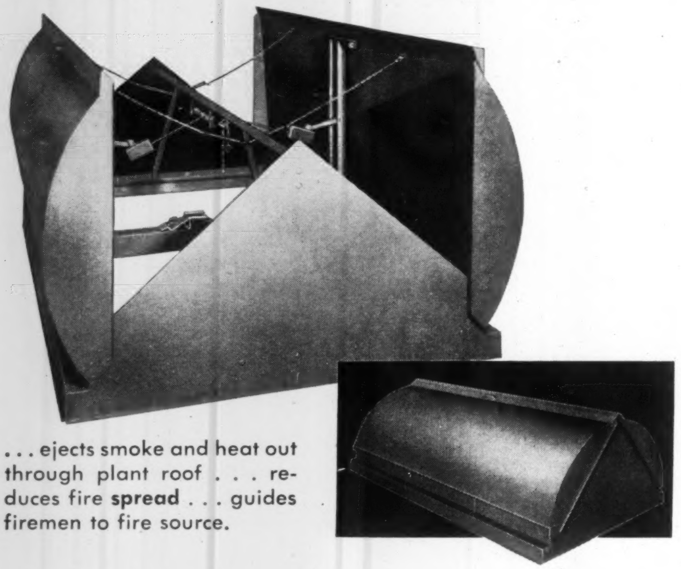
WEIL-McLAIN COMPANY
MICHIGAN CITY, INDIANA

Address literature requests to Dept. AA-47

Keep your fire loss Down

with the efficient new

Swartwout Pyrojector



. . . ejects smoke and heat out through plant roof . . . reduces fire **spread** . . . guides firemen to fire source.

Pyrojector is an effective answer to fires that billow up and spread under closed roofs. It opens a 28 square foot draft-fed escape vent for smoke and flames. Heat at 212° F. melts a fusible link — releases powerful spring force that opens dampers instantly.

This is a completely new design, with unusual features. Low contour (only 29" above curb), neat appearance. Installs and operates *entirely above roof level.* Spot it over most likely fire sources, singly or in groups. Or alternate with roof ventilators. Weatherproof when closed. Can be opened for extra ventilation in dry weather. Dampers are double wall construction, insulated. Release mechanism is rugged, positive.

For complete details of this new "escape" ventilation unit, write today for Form 701-F.

The Swartwout Company, 18511 Euclid Ave., Cleveland 12, Ohio

Swartwout ROOF VENTILATORS AND VENTILATING LOUVERS

ALSO AUTRONIC PROCESS CONTROL EQUIPMENT

INDEX TO ADVERTISERS

continued from page 308

Remington Arms Co. 268
Rempe Co. °
Republic Steel Corp. 191
Research Products Corp. °
Revere Copper & Brass, Inc. 89
Reznor Mfg. Co. °
Richmond Engineering Co., The 199
Ric-wiL Inc. 271
Ridge Tool Co., The 10, 11
Rigidbilt, Inc. 300
Robert Mfg. Co. °
Roberts-Gordon Appliance Corp. °
Robvon Backing Ring Co. °

Sarco Co., Inc. 75
Sarcotherm Controls, Inc. 77
Shaw-Perkins Mfg. Co. °
Skidmore Corp. °
Skil Corp. 79
Slant-Fin Radiator Corp. 264
Smith Co., Inc., H. B., The °
Spang-Chalfant Div., of The National Supply Co. 200
Spence Eng., Inc. 311
Spencer Heater, Avco Mfg. Corp. 16, 17
Spencer Thermostat Div., Metals & Controls Corp. °
Sporlan Valve Co. °
Spraying Systems Co. °
Standard Stamping & Perforating Co. 283
Stephens-Adamson Mfg. Co. °
Sterling Engrg. & Mfg. Corp. °
Sterling, Inc. °
Stillwater Clay Products Co., The 186
Stoddard Industries, Inc. 300
Superior Combustion Industries, Inc. 76
Surface Combustion Corp. °
Swartwout Co., The 310
Swift & Company °
Synchronous Flame Inc. 280

Tabery Corporation 35, 36
Taco Heaters, Inc. 251
Tapecoat Company, The °
Taylor Forge & Pipe Works 192, 193
Taylor Instrument Cos. 312
Tejax Engineering Corp. °
Tesco Incorporated °
Thermal Engineering Corp. 267
Thor Power Tool Co. °
Titus Mfg. Corp. 8, 9
Titusville Iron Works Co. The Div. of Struthers Wells Corp. °
Torrington Mfg. Co. 209
Trane Co., The 48, 49
Tube Turns, Inc. °
Tuthill Pump Co. °
Tuttle & Bailey Div. of Allied Thermal Corp. °

United Cork Companies °
United States Gauge Div., American Machine & Metals, Inc. 222
United States Register Co. °
United States Rubber Co. 215
United States Steel Corp. 196
United Wire & Supply Co. °
Universal Diffuser Corp. °
Utility Appliance Corp. °
Utility Fan Corp. 34, 201

Van Dorn Iron Works Co. 295
Vapor Heating Corp. 204
Vilter Mfg. Co., The 275

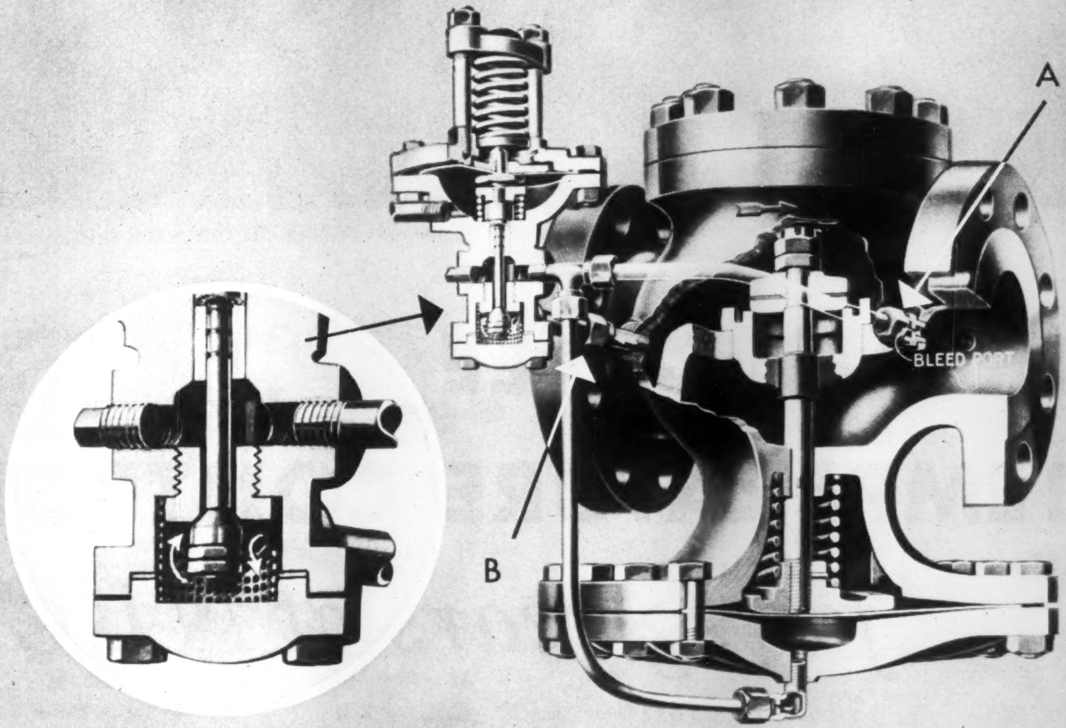
Wagner Electric Corp. 78
Walker Mfg. & Sales Corp. °
Walworth Co. °
Waterloo Register Co. °
Watts Regulator Co. 91
Webster & Co., Warren 85
Webster Engineering Co., The °
Weil-McLain Co. 309
Weil Pump Co. 297
Weinman Pump Mfg. Co. 281
Weirton Steel Co. °
Weksler Thermometer Corp. 305
Western Eng. & Mfg. Co. °
Westinghouse Electric Corp., Air Cond., Div. 203
Wheatland Tube Co. °
Wheelco Instruments Div., Barber-Colman Co. °
Wheeler Mfg. Co., C. H. 277
Wheeling Steel Corp. 223
White-Rodgers Co. °
Whitlock Mfg. Co., The °
Will-Burt Company, The °
Wilson Inc., Grant °
Wing Mfg. Co., L. J. 207
Wiremold Co., The °
W-K-M Manufacturing Co., Inc. °
Wolverine Tube Div. of Calumet & Hecla, Inc. 70
Worthington Corp. 27
W-S Fittings Div., H. K. Porter Co., Inc. 230

Yarnall-Waring Co. 184
Yeomans Brothers Co. 306
York Corporation 178, 179
York-Shipley, Inc. 235
Young Radiator Co. °
Young Regulator Co. °
Youngstown Sheet & Tube Co. 24
Yula Water Heaters, Inc. 218

Zallea Bros. 194
Ziegler & Co., G. S. 198

VALVE TIPS:

Advantages of External Pilots in Automatic Regulating Valves



Spence Type ED Pressure Regulator

"Maintenance-free, trouble-free, install-and-forget." They're all pretty phrases, but every engineer knows from experience they don't apply to regulating valves. Any valve designed to control temperatures or pressures within tight limits can be affected by dirt or other foreign matter in steam lines.

One advantage of the external pilot mounting shown above is simplified maintenance. Trouble shooting is faster, downtime is reduced, and tempers don't take such a beating. Here's why:

If trouble develops, it's easy to find out if it's in the pilot or the main valve. Just remove the tubing bend at A. A simple test, without any instruments or other equipment, shows where the trouble is.

If the trouble is in the pilot, you can remove it by disconnecting the unions at B. There's no need to take the main valve out of the line.

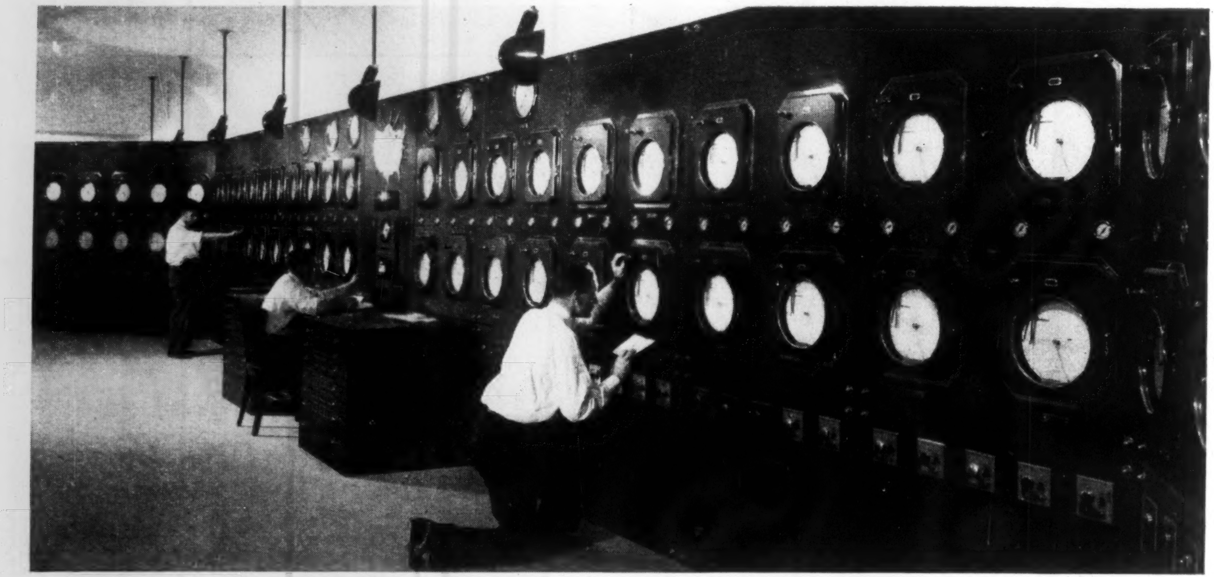
The quickest way to get the regulator functioning again is to install a spare pilot. This is easy — and in the Spence design it's not expensive to carry spare pilots. Spence pilots fit all sizes of Spence main valves. There's no need to stock an expensive inventory of pilots for each main valve size.

In the enlarged sectional drawing above, you can see how the strainer, seat and disc of the pilot are readily accessible by removing the blind flange.

If the trouble is in the main valve, here again inspection is easy. If there's dirt in the steam line, it may clog the bleed port or restriction orifices. In the Spence design these can be inspected and cleaned by merely removing the tubing connections. The seat and disc of the main valve can also be inspected easily by removing the top flange.

These maintenance advantages, plus other advanced design features, are available for a wide range of regulating applications. For information on Spence's wide range of different automatic regulating valves, write for your copy of Bulletin 1005.

SPENCE ENGINEERING COMPANY, INC.
Walden, New York



Taylor-Controlled Air Conditioning System at NBC, RCA Building, New York.

TROUBLE-FREE TEMPERATURE CONTROL *for 23 years at NBC!*

THE Taylor-controlled air conditioning system at RCA Building in New York has maintained constant temperature control for 23 trouble-free years.

This 1934 installation in the National Broadcasting Company's studios and offices was the first major air conditioning system using Taylor FULSCOPE* Wet and Dry Bulb Controllers. "Almost human!" was the comment of the air conditioning engineer who specified the control system and supervised its installation.

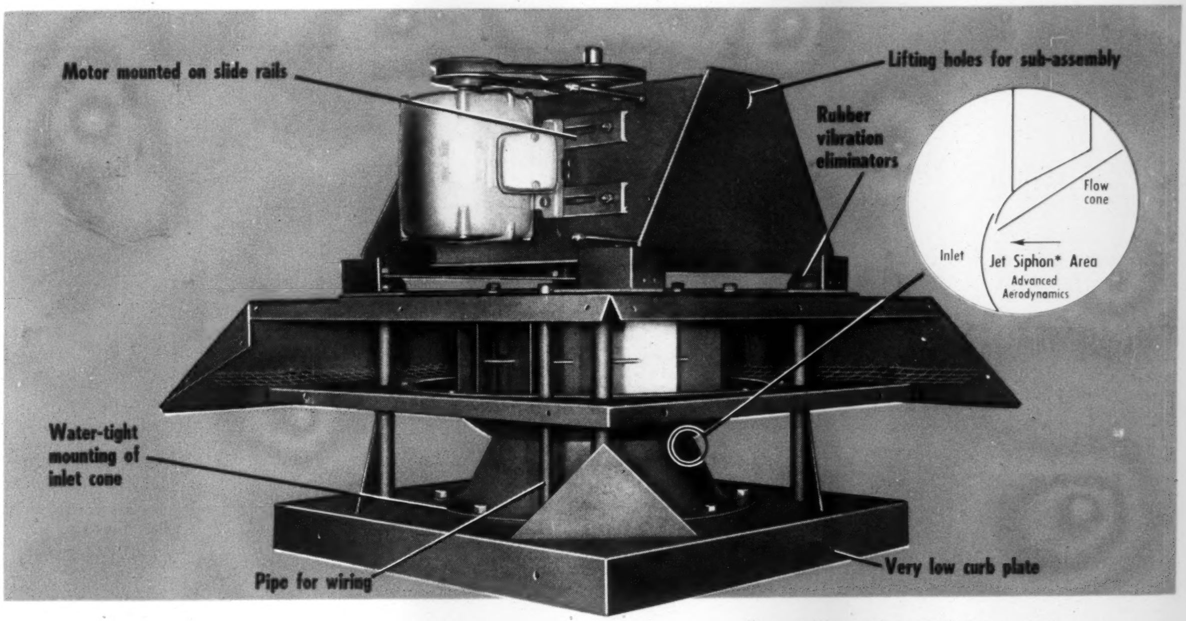
23 years ago Taylor engineers were so confident of trouble-free service that the temperature tube systems, some as long as 600 feet, were cemented into partitions in the RCA Building. That confidence came from tube system research, pioneered by Taylor 20 years prior to 1934. That same research has been routine throughout the years to bring you many new refinements in tube system design, plus new control instruments. Today Taylor gives you even greater assurance of trouble-free air conditioning.

Whether you're planning air conditioning for human comfort or product quality—or both, specify Taylor Instruments for the very finest in simplicity, accuracy, and dependability. Ask your Taylor Field Engineer, or write for **Catalog No. 5.** Taylor Instrument Companies, Rochester, N.Y., and Toronto, Canada.

*Reg. U.S. Pat. Off.

Taylor Instruments
MEAN
ACCURACY FIRST

VISION · INGENUITY · DEPENDABILITY


Motor mounted on slide rails
Lifting holes for sub-assembly
Rubber vibration eliminators
Flow cone
Inlet
Jet Siphon* Area
Advanced Aerodynamics
Water-tight mounting of inlet cone
Pipe for wiring
Very low curb plate

Shown with weather enclosure removed

PLUS VALUES . . . all yours in the Clarage Centrilator

POWER ROOF VENTILATOR — CENTRIFUGAL TYPE

Jet Siphon* feature for stable, high efficiency.

Static pressures to 2″ — thus well suited to both light-duty installations without ductwork and applications where ductwork or hoods impose considerable resistance.

Adaptable to a wide range of motor sizes.

Variable pitch V-belt drive.

Wheel and inlet designed for streamlined air flow.

Built heavy-duty throughout to assure long-lasting, trouble-free service.

Every wheel statically and dynamically balanced on precision machines.

Inspection panel and complete accessibility.

Low overall height.

Venting of motor and drive area.

Engineered and constructed for extra quietness.

Heavy-duty anti-friction bearings.

Simple installation — only 4 bolts required.

Write today for Bulletin 550. Clarage Fan Co., Kalamazoo, Mich.

*Patent applied for

CLARAGE

. . . dependable equipment for making air your servant

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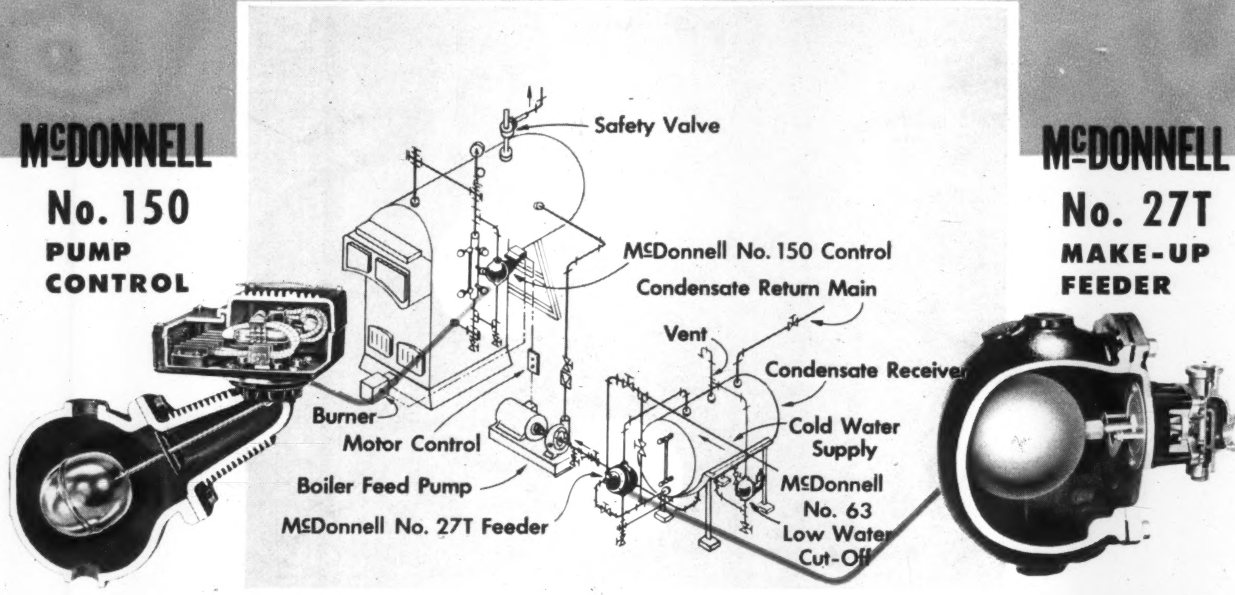
Here's the GREAT COMBINATION for those Medium Pressure Boilers

McDONNELL
No. 150
PUMP CONTROL

McDONNELL
No. 27T
MAKE-UP FEEDER



Pump Control, Low-Water Fuel Cut-off and Low Water Alarm

The No. 150 has two mercury switches. One provides a circuit for starting and stopping feed pump; the other has circuits for low-water cut-off of the burner and for low-water alarm bell if desired. Underwriters' listed.

It is built throughout to stand up under pressure and temperature encountered in boilers of any type or size; maximum steam pressure, 150 lbs. It has no stuffing boxes to cause trouble. Packless construction is provided by extra-heavy monel sylphon bellows. Switch leads have heat-impervious, porcelain-bead insulation. Mechanism is sealed to guard against tampering. Thousands of installations attest the dependability of this control.

How to use them . . .

This is the team of thoroughbreds that takes all the worries and troubles out of water level and feed pump control for medium pressure boilers—boilers with steam pressures up to 150 psi.

The drawing above shows the simple hook-up. The No. 150 controls the boiler feed pump directly from the boiler water level. This holds the boiler water level within close limits that assures maximum steaming efficiency and fuel economy. Any deficiency in the returns is at once replaced by the No. 27T Make-up Water Feeder on the receiver.

An extra switch on the No. 150 provides circuits for cutting off burner and sounding low water alarm in the event of some emergency such as current interruption in the pump circuit or failure of make-up water supply.

Yes, this set-up gives you close control of the water level and maximum protection from low water. Ask for simple installation and wiring diagrams.

Float-operated make-up water feeder for receiving tanks

The No. 27T is particularly suited for the task of maintaining the minimum water level required in condensate receiving tanks.

With a large water feeding capacity, it is capable of meeting any sudden demands of make-up water required by the boiler and the process system. The ample capacity further allows the No. 27T to be mounted at a relatively low point on the receiving tank. This provides adequate space for the return condensate, and prevents wasteful overflow. Its sturdy design and rugged construction enables it to withstand the unusually turbulent conditions often prevalent in the receiving tank. For tank pressures to 35 lbs., water supply pressures to 100 lbs. Other McDonnell Make-up Feeders, including flange-mounted types, available for almost all needs.

McDONNELL & MILLER, *Inc.*, 3500 N. Spaulding Ave., Chicago 18, Ill.

Doing One Thing Well

Your Jobber Stocks Them

McDONNELL *Boiler Water Level Controls*